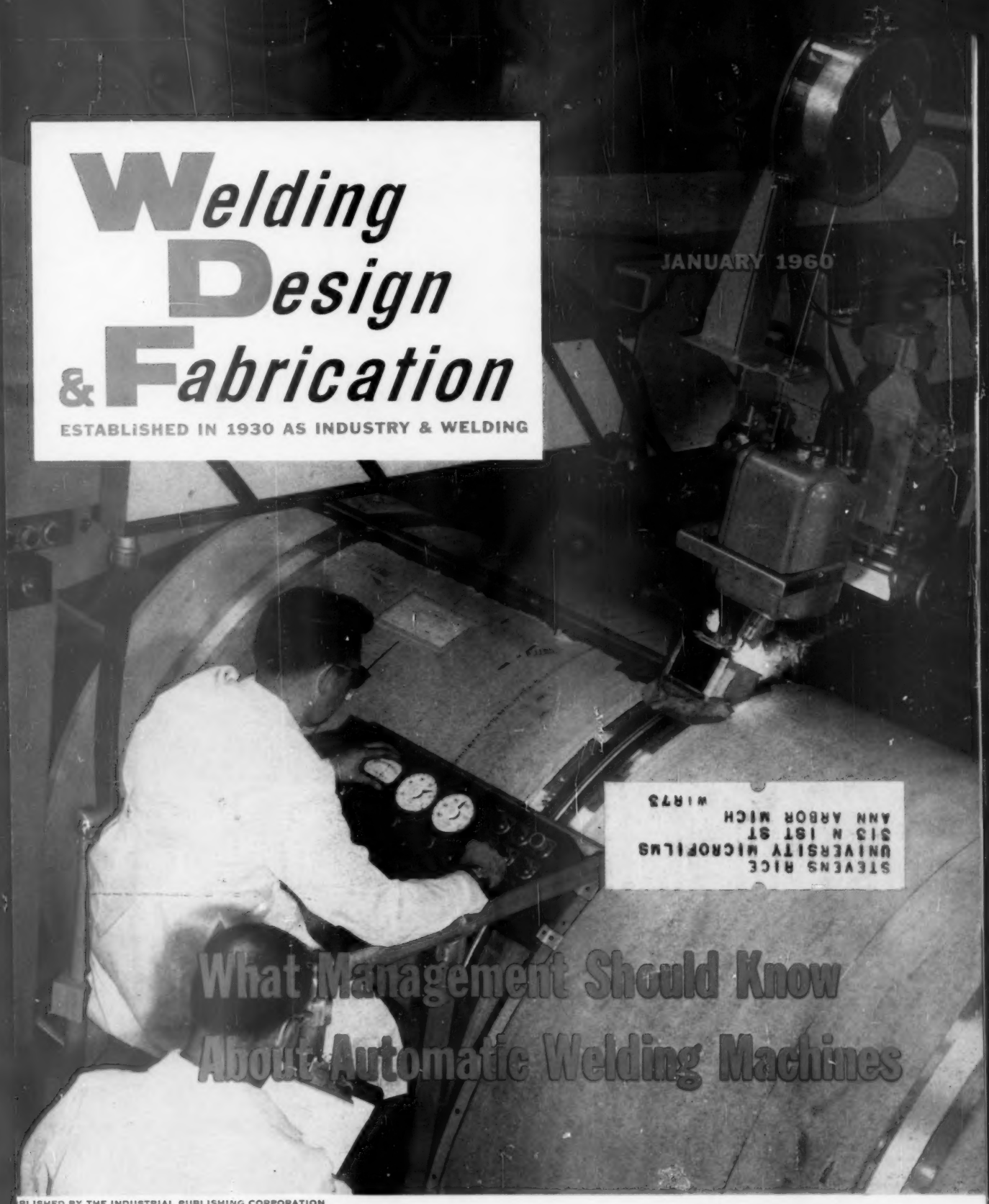
Welding Design & Fabrication

ESTABLISHED IN 1930 AS INDUSTRY & WELDING

JANUARY 1960



STEVENS RICE
UNIVERSITY MICROFILMS
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ANN ARBOR MICH
W1R73

What Management Should Know About Automatic Welding Machines

BLISHED BY THE INDUSTRIAL PUBLISHING CORPORATION

The magazine of welding management, production, and engineering

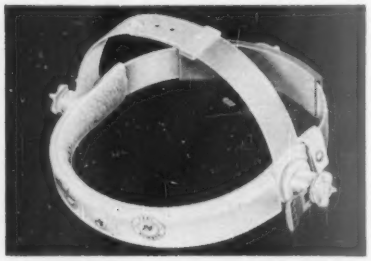
QUALITY JACKSON PRODUCTS®

Vinylfoam Sweatbands

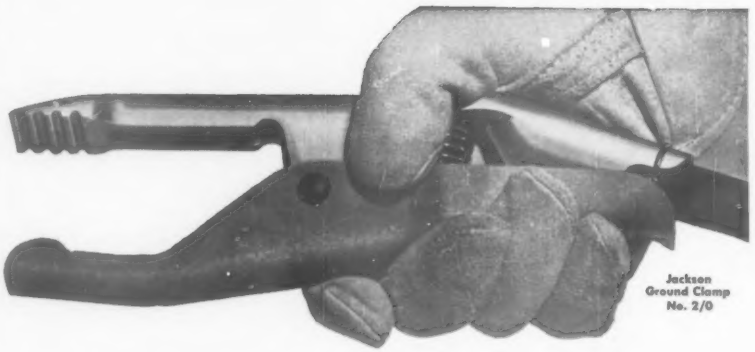
Offering the utmost in comfort and highly moisture absorbent, these new sweatbands are now furnished, at no extra cost, as part of the plastic headrests of Jackson goggles and of the type J-1 face shield. They hold the headrest more firmly on the head and will keep their bright, clean appearance by being easy to clean or sterilize. As replacement parts they fit all Jackson headrest goggles and J-1 face shields now in use.

Goggles W-70, W-60 and W-50 have plastic headrest with telescopic arms for firmer fit, easier positioning. Now more comfortable than ever with new sweatband, part 41.

Popular face shield type J-1 with wide choice of visors in clear and in shades of green. New vinylfoam sweatband, part 27, fits the headrest of type J-1 and goggles BX.



New Vinylfoam sweatband part 74 is offered as an optional part on the Adjust-O-Lok headgear of Jackson welding helmets and the Musketeer face shield. Quickly fastened with snap buttons, it makes this unequalled headgear even more comfortable and fit more firmly.



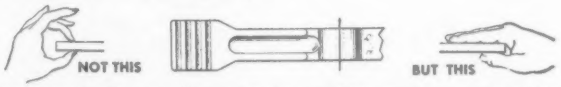
Jackson Ground Clamp No. 2/0

Good Grounds for Welding Profits

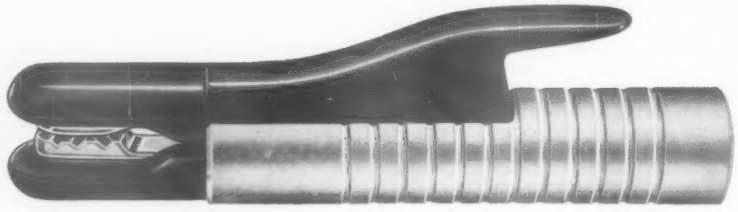
Jackson Ground Clamps

Are current leaks eating up your welding profits? Jackson Ground Clamps provide ample flow of current, stop power losses. Simple, rugged design has copper alloy upper tong for broad metal-to-metal contact, lower tong for pressure.

Shaped to fit the hand, the tongs open wide, go *on* and *off* easier. Strain on cable is reduced by angle of socket, to which cable may be wired. Insulation between tongs prevents accidental arcing. Ground Clamps (as well as Cable Connectors, Splicers and Lugs) are made to fit cables from No. 4 through 4/0.



Large contact area of upper tong provides greatest conductivity



New Arc Welding Electrode Holder

Jackson Model JH-1

This small, lightweight copper alloy holder of streamlined design is a well constructed quality tool at a low price. It is a safe, well insulated electrode holder for general use within its rated capacity, and an ideal unit for farm welding, shop maintenance and repair work.

The cable may be mechanically clamped, brazed, or soldered as in all other famous Jackson holders with copper alloy tongs. Jaw insulators and lever are of high-compression molded plastic of excellent quality, yet are inexpensive to replace.

Model JH-1 • Electrodes through 5/32" • 150 Amps • 8" long • 12 oz.

Sold World-Wide through Distributors and Dealers

Jackson Products

AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.

31739 Mound Road, Warren, Michigan

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THE NEW HOBART AUTO-FLUX H-400*

FOR SUBMERGED ARC PROCESS:

1. DEEP GROOVE

HAS VERY LITTLE "FLASH-THROUGH" . . .

WELDING

INSENSITIVE TO MILL SCALE . . .

2. HIGH AMPERAGE

(UP TO 1200 AMPERES)

APPLICATIONS

HORIZONTAL FILLETS, BUTT WELDS . . .

3. MULTIPASS

VERY VERSATILE —

WORK

Bryan —
These snap shots are excellent —
① Shows heavy plate submerged arc process —
② Shows multipass angle — They sure back up our story on the new Auto Flux H-400!
Bob Rediger

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"Manufacturers of the World's Most Complete Line of Arc Welding Equipment"

How Ni-Rod "55" builds up worn cast iron... keeps repair cost down

When the owners of the M V Sunprincess heard it would cost them over $7,200 to replace all six worn ship pistons, they quickly called in J & R Weir Ltd., Marine Engineers, Montreal.

These engineers in turn recommended a Ni-Rod "55"* repair job – welding to be done by Welding Engineers Ltd., Montreal.

Wear ran as high as ⅛ inch on some of the piston ring grooves. But with Ni-Rod "55" Electrodes, welders soon had all six pistons back in the ship at a total cost of $2,450 – a saving of over $4,750.

How they did the job with Ni-Rod "55"

Using Ni-Rod "55" Electrodes, they welded cast iron inserts into position on the pistons to offset the worn areas. The pistons were pre-heated to 500°F and each of the 6 inserts welded into position with two passes by manual arc-welding. After welding, the pistons were covered with asbestos to cool. Ni-Rod "55" eliminated the need for post-heating. Then the pistons were machined and returned to the engine.

For your jobs

Ni-Rod "55" can be used to build up worn areas in almost all cast iron parts. Auto, truck, or ship pistons . . . valve seats . . . cylinder walls . . . are just a few. And the cost is just a fraction of what replacement would cost. What's more, with Ni-Rod "55", the repair is done quickly and easily. Welds are strong, sound, highly machinable.

Keep Ni-Rod "55" in mind for building up worn areas on cast iron parts. Even better, have a supply of these electrodes on hand. Look in your classified directory under "Nickel" for your local supplier.

And *write* for "Repair Cast Iron Parts Quickly and Easily" for the complete Ni-Rod "55" story.

HUNTINGTON ALLOY PRODUCTS DIVISION
The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

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INCO WELDING PRODUCTS
TRADE MARK
electrodes • wires • fluxes

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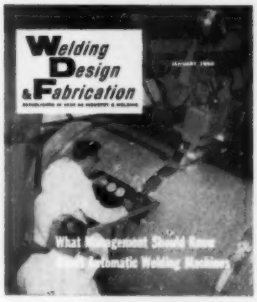

for January, 1960

COVER: This automatic gantry welder used to make girth welds on missile shells is typical of the new and precise automatic welding machines being used more and more everyday. A special WELDING DESIGN & FABRICATION report on what industry management should know about this automatic welding machine and others like it starts on page 31. (See page 45 for more information on this gantry welder.)

FEATURES

31 WHAT MANAGEMENT SHOULD KNOW ABOUT AUTOMATIC WELDING MACHINERY

Users and manufacturers of automatic welding machinery tell industry management what they should know about automatic welding machines.

32 WHAT USERS LOOK FOR IN AUTOMATIC WELDING MACHINERY

Users of automatic welding equipment tell how a proposal to buy starts and how it is approved. Users explain how they make searches, draw comparisions and even rate suppliers—before they approve a machine's purchase.

34 SIX QUESTIONS ON AUTOMATIC WELDING MACHINERY

Leading manufacturers of automatic welding machines present a check list. Industry management will know all they need to know about automatic welding machines if they get the answer to these questions.

36 AUTOMATIC PROCESS SPEEDS VERTICAL WELDING OF HEAVY PLATE

New automatic machine permits continuous, one-pass welding of plate or forgings from 1½- to more than 10-inches thick which can be welded vertically.

45 GANTRY WELDER SPEEDS GIRTH WELDING OF MISSILE SHELLS

Two new gantry welders and a 180-foot long bed of turning rolls team up to lick a bottleneck.

46 BREAKTHROUGH FOR TITANIUM-CLAD VESSELS

New welding techniques open the door for the use of titanium-clad vessels throughout the chemical, petrochemical, paper and other processing industries.

48 REDESIGN FOR WELDING CUTS LATHE COST 35 PERCENT

Oliver Machinery Co. redesigned a 50-year old cast iron lathe for welded construction. The new lathe sells for 35 percent less than the cast iron one.

52 ALLOY STEEL PRESSURE VESSELS PROOFED AT 155,000 psi

Close processing controls and critical inspection and testing keep welding rejects under one percent at Hughes Aircraft.

54 DESIGN FOR COLD-WELDING MAKES VACUUM-TIGHT COPPER JOINTS

An engineered cold-welding line makes possible top quality, high volume production of copper transistor components.

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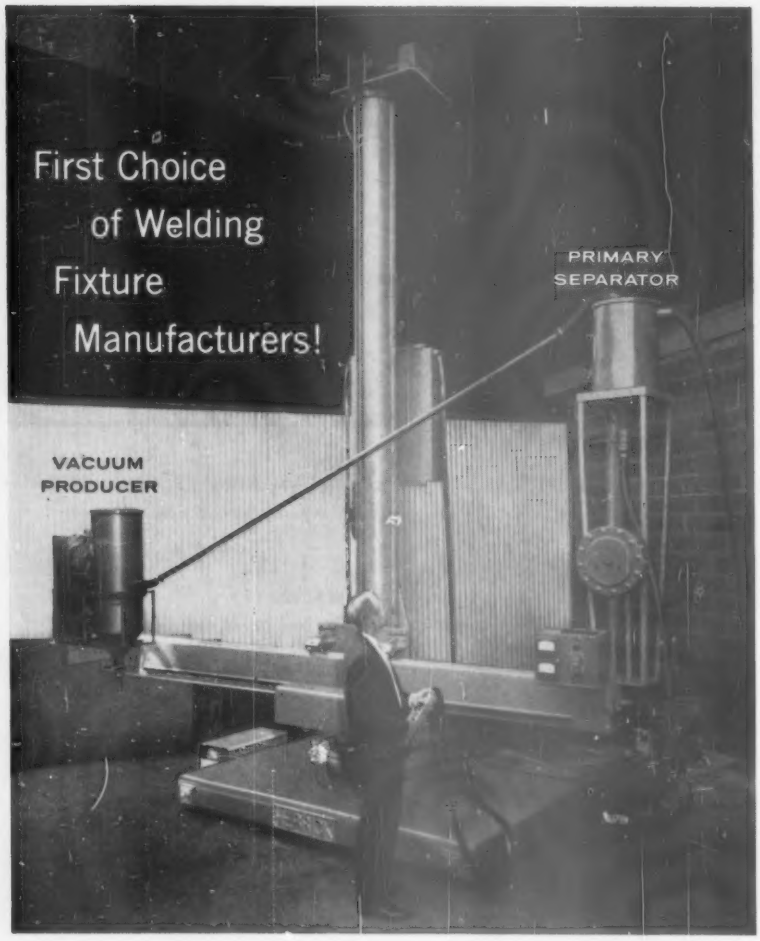
Copyright 1960 by The Industrial Publishing Corporation, Cleveland, Ohio. Volume 33, Number 1.

Accepted as a Controlled Circulation publication at Pontiac, Illinois. Postmaster: Send form 3579 to Room 800, 812 Huron Road, Cleveland 15, Ohio



INVINCIBLE UNITS

Automatically Reclaim Flux

This automatic ram type manipulator made by C. B. Herrick Manufacturing Corp., Cleveland, is used for welding steel plate bridge girders. Mounted on the carriage, an Invincible Flux Recovery Unit travels with the welder along the full length (up to 130 feet) of the girder. It recovers all unfused flux . . . removes powder . . . and returns slag-free, dust-free flux to the welder automatically, in a continuous flow.

Fixture manufacturers—and users—specify Invincibles because they are engineered specially for handling abrasive materials and for continuous operation. Their rugged construction assures years of full-time operation—no loss of production time.

Savings in reclaimed flux alone pay their cost in a few months, even weeks. In addition, Invincibles save costly man-hours over manual methods, speed-up production, minimize rejects.

In 14 standard automatic and manual models (1½ to 7½ H.P.). Accurate free surveys of your submerged arc welding operations can be made on short notice. Resident engineers in all principal cities.

Send for Invincible Flux Recovery Equipment Folder.

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SUBSCRIPTIONS in U. S. and possessions: $7.00, 1 year; $12.00, 2 years. Canada: $8.00 per year. Foreign: $10.00 per year, payable in advance in U.S. funds. U.K.: £3.50 per year payable in Sterling to London office. Single copy price: $.75.

WELDING DESIGN & FABRICATION
was established in 1930 *as*
INDUSTRY & WELDING
and is published monthly by

The INDUSTRIAL PUBLISHING CORPORATION
812 Huron Rd., Cleveland 15, Ohio
IRVING B. HEXTER . . . . . *president*
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Printed in U.S.A.

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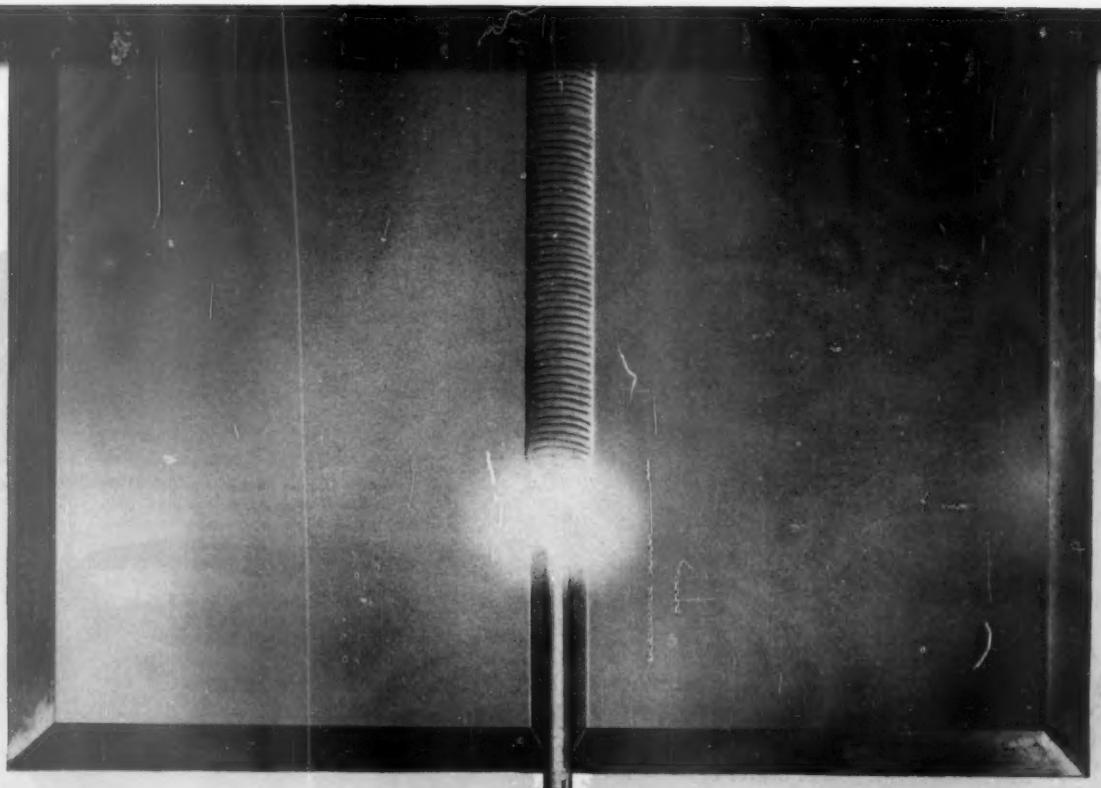

P&H announces a new and complete line of STAINLESS STEEL ELECTRODES

In addition to a wider choice, Harnischfeger offers you stainless steel electrodes with exceptional weldability and quality control in all AWS-ASTM types. Improved chemistry assures stronger, smoother beads, with less spatter and easier slag removal. Write for Bulletin R-49 which gives the chemical range and mechanical properties of each P&H stainless steel electrode listed here. And tell us about any special requirements you may have. We'll be happy to work with you.

P&H TYPE	AWS CLASS
Harstain 308	E-308-15
Harstain "A" 308	E308-16
Harstain 308 ELC	E308 ELC-15
Harstain "A" 308 ELC	E308 ELC-16
Harstain 309	E309-15
Harstain "A" 309	E309-16
Harstain 309 Cb	E309 Cb-15
Harstain "A" 309 Cb	E309-Cb-16
Harstain 309 Mo	E309 MO-15
Harstain "A" 309 Mo	E309 MO-16
Harstain 310	E310-15
Harstain "A" 310	E310-16
Harstain 310 Cb	E310 Cb-15
Harstain "A" 310 Cb	E310 Cb-16
Harstain 310 Mo	E310 Mo-15
Harstain "A" 310 Mo	E310 Mo-16
Harstain 312	E312-15
Harstain "A" 312	E312-16

P&H TYPE	AWS CLASS
Harstain 316	E316-15
Harstain "A" 316	E316-16
Harstain 316 ELC	E316 ELC-15
Harstain "A" 316 ELC	E316 ELC-16
Harstain 317	E317-15
Harstain "A" 317	E317-16
Harstain 318	E318-15
Harstain "A" 318	E318-16
Harstain 330	E330-15
Harstain "A" 330	E330-16
Harstain 347	E347-15
Harstain "A" 347	E347-16
Harstain 349	E349-15
Harstain "A" 349	E349-16
Harchrome 502	E502-15
Harchrome 505	AISI 505
Harchrome 410	E410-15
Harchrome 430	E430-15

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GET RARE
COMFORT AND FIT
PLUS ADDED
PROTECTION,
IMPROVED VISION . . .

S-42 Chippers Goggle with flat or 6:00D Bal-SAFE lenses, clear or in Ray-Ban shades 1, 2 or 3.

W-35 Chippers Eyeshield with two Enduron 2"x4¼" plates; gives increased protection and provides air space which further reduces fogging.

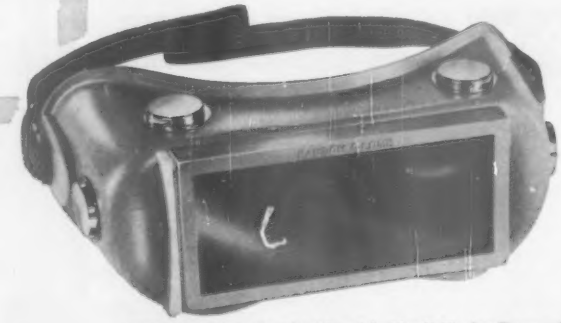
Insure workers a greater degree of safety than ever before; give them more comfort, better vision. Insure more worker cooperation, too, because these goggles and eyeshields are so good looking in their new opaque flesh color and bright nickel louvers, vents and head bars!

RUGGED SOFTIES!

Soft and flexible, they fit snugly, comfortably. Eyeshield plates are replaced in seconds through side opening. Goggle head bars are adjustable—as are two-tone elastic headbands. For more details, prices, write today: Bausch & Lomb Optical Co., 91049 Lomb Park, Rochester 2, N. Y.

Bausch & Lomb
chippers and welders
FLEXIBLE GOGGLES
and EYESHIELDS

S-41 Welders Goggle with Arc-Ban lenses in shades No. 3 through No. 6, with tough Enduron plastic cover lenses.



W-36 Welders Eyeshields with 2"x4¼" Arc-Ban welding plate, shades No. 3 through No. 6, with Enduron cover plate.

BAUSCH & LOMB
SINCE B&L 1853

Protection PLUS Safety Products

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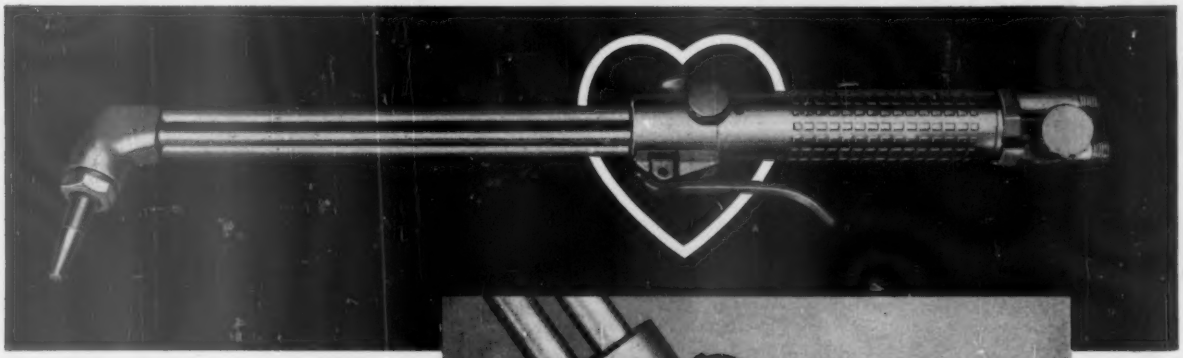

This New Airco 9500 Torch was designed with the operator in mind. Its smooth-working "E-ZE-OX" cutting oxygen valve, its fine balance and heft, its preheat valves located on same side of torch, its rugged triangular tube arrangement, its "corncobbed" knurled handle for nonslip grip — all make the 9500 a favorite with experienced welding men. Sizes 13" to 72".

the Heart of the NEW AIRCO 9500 TORCH

is the exclusive NEW "E-ZE-OX" VALVE for Cutting Oxygen

When an operator starts a cut with the Airco 9500 Torch, the new "E-ZE-OX" valve lets him open the cutting oxygen valve smoothly — and effortlessly — so there is no splash of molten metal. Nor will the torch kick up to mar the plate outside of the work area. This is particularly important in piercing starts. Heads available in three angles: 45°, 75° and 90°. Look in the Yellow Pages of your phone book under "Welding Equipment and Supplies" for the Airco Office or Authorized Airco Dealer nearest you.

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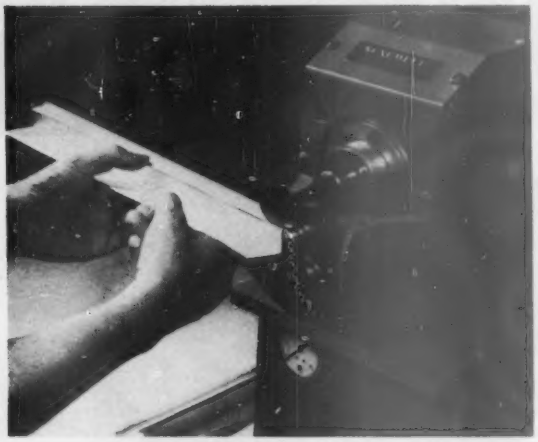
WELDING MANAGEMENT

watches these developments



ANOTHER ADVANCE *in high speed ultrasonic seam welding of aluminum has been announced by Aluminum Company of America and Aeroprojects Incorporated. The cooperative program now makes it possible to use ultrasonics for seam welding light gauge sheet and foil in thicknesses ranging from* 0.006- *to* 0.010-*inches at speeds above* 30 *fpm. Speeds above* 100 *fpm have been demonstrated using ultrasonic seam welding on thinner aluminum materials.*

WELDING SUPPLY DISTRIBUTORS showed an increase of 17 percent in sales for the Third Quarter, 1959, compared to the same period in 1958. One hundred and ninety-eight members of the National Welding Supply Association supplied figures on their sales of welding equipment and supplies for the Association's latest Quarterly Report. The Eastern Zone of the N.W.S.A. showed an increase of 18 percent, while the Southeastern Zone increased 16 percent. A 23 percent increase was reported by the Central Zone, while the West Central, Southwestern and Western Zones increased sales 14 percent.

INITIAL ORDERS *for aluminum ballistic armor plate to be used in the first production models of the M-*113, *the Army's new lightweight personnel carrier, have been placed by Ford Machinery and Chemical Ordnance Division. The plate is high strength, weldable aluminum alloy* 5083, *developed by Kaiser-Aluminum & Chemical Corp.*

*An armored, amphibious tracked vehicle which weighs about nine tons, the M-*113 *will replace the Army's present* 20-*ton steel M-*59 *carrier. Armor for the M-*113 *is aluminum alloy providing the same level of protection against shell fragments and small arms fire that steel offered the M-*59. *A number of M-*113 *component parts and the power plant are also made of aluminum.*

BUSINESS IN 1960 *will be the best in history, despite the depressing effects of the steel strike. At the same time, corporate profits will top this year's record by* $5 *or* $6 *billion, and consumer incomes and spending will increase* 5 *percent over* 1959. *These are some of the projections carried in the "Annual Business Forecast for* 1960", *prepared by the staff of the Report for the Business Executive, weekly business service of The Bureau of National Affairs, Inc. All of the forecasts are based on the expectation that the steel strike will not be renewed after the first of the year.*

UNITED STATES PRODUCTION of gases and carbide is revealed in figures released by the U. S. Department of Commerce. A Bureau of the Census report permits a comparison of the first half of 1959 with the same period in 1958.

	Production, first 6 months		
	1958	1959	
Acetylene	4,876	5,990	million cu. ft.
Calcium Carbide	427,895	507,451	short tons
Oxygen, high purity	16,434	26,667	million cu. ft.
Oxygen, tonnage	488,774	703,778	short tons
Nitrogen	3,171	5,818	million cu. ft.
Argon	180	233	" " "
Hydrogen	20,230	26,020	" " "

A REMARKABLE NEW FAMILY *of high strength nickel alloy steels has been developed by International Nickel Co., Inc. Identified as* 25 *percent nickel steels, these new alloys achieve unique properties by simply air cooling from the heat treating temperatures. Yield strengths in excess of* 250,000 *with six to ten percent elongation and above* 20 *percent reduction in area are obtainable in section thicknesses where such properties were not heretofore attained. In some cases yield strengths in excess of* 290,000 *psi have been achieved. Maximum hardness in excess of* 67 *Rockwell C has been obtained.*

The new steels are weldable in the hardened condition without preheat. This feature, combined with high strength properties, is expected to make the alloy important in heavy wall pressure vessels and defense applications.

THE AMERICAN STANDARD CODE for Pressure Piping is undergoing major revisions and, after approval by ASA, is being republished in separate sections by the American Society of Mechanical Engineers. The latest revised section to be published is B31.4-1959, Oil Transportation Piping, including all piping carrying crude oil, petroleum products and liquefied petroleum gas.

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A new twist in the tale of the Phoenix Bird...

WORTHINGTON

as told by RANSOME

Like the phoenix bird, Ransome is born anew!

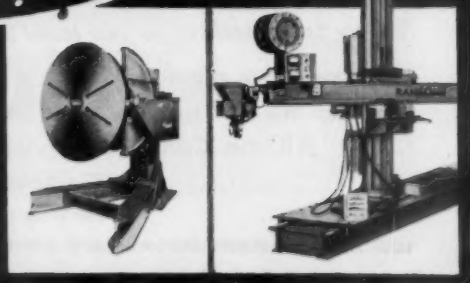
Huddled around a campfire somewhere in the Arabian deserts, they often tell the legendary tale of the phoenix bird, a mythical creature destined to flourish a number of years, to fade away, and then to emerge again in greater glory.

In the welding industry, they're telling the remarkable story of the Ransome Machinery Company. Born 110 years ago, Ransome established itself as a prime supplier of fine machinery. In 1932, Ransome pioneered positioning equipment for the welding industry. Then in 1943, Ransome was merged with the Worthington Corp., and progressed as a subsidiary of that company.

Today, having bought Worthington's positioning equipment business, the Ransome name shines anew. Organized once again as an independent entity to be known as Ransome Company, Ransome is infused with young bloods eager to prove their mettle under the veteran top management that directed the division while part of Worthington.

The **new** Ransome Company pledges to uphold its heritage of fine craftsmanship and service and re-dedicates itself to the design and manufacture of the most advanced machine tools for automation welding.

Ransome combines the best of the old with the newest. Call on the new Ransome Company for creative imagination in filling your automatic welding needs.



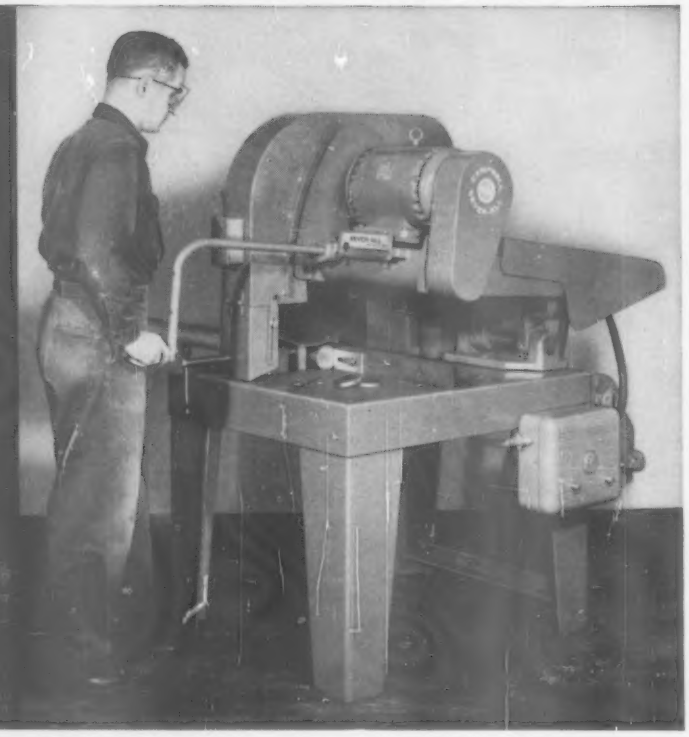
Ransome Company

Scotch Plains, New Jersey

RANSOME THE PIONEER IN POSITIONING FOR WELDING

NEW!

GREATEST CUT-OFF CAPACITY IN ITS CLASS!



• This newest addition to the Sever-All line of abrasive cutting machines—the Model 2-A—provides greater cutting capacity and more flexibility than any other machine in its class. Check these important advantages:

Big capacity • cuts 4″ round or square solids, 5½″ O.D. pipe or tubing, 6″x1″ flat stock, 6″ angle iron and 8″ channels. Cuts practically all metals.

Fast operation • accurate cuts at the rate of 2 to 3 seconds per square inch. For instance, you can cut a 4″ bar of hardened steel in 45 seconds, or a 2″ pipe in 3 seconds.

Power oscillation • oscillation—the forward and backward motion of the cutting wheel as it is fed down into the cut—gives you extra cutting capacity without excessive horsepower load on your power lines. It also contributes to longer wheel life and reduced operator fatigue.

Quality cuts • clean, smooth cuts, even on large sections, because wheel oscillation provides cooler cutting action.

Economy • Sever-All abrasive cutting wheels, developed specially for the Model 2-A, assure you of lowest cost per cut.

Safe • wheel guard provides complete operator protection.

Minimum maintenance • all bearings are the pre-lubricated and sealed type. Clean, simple machine design permits easy housekeeping.

Built to last • rugged machine bed and rigid castings make the Model 2-A first choice for heavy-duty jobs.

VARIETY OF WORK HOLDERS GIVES UNUSUAL VERSATILITY

V-block with quick-action clamp

Angle-cutting work holder

2-way clamp for irregular shapes

Choose the work holders you need from several optional arrangements. These include the vise-type holder shown on the machine at top, plus the V-block, angle-cutting and 2-way clamp fixtures above. All fit interchangeably on the Model 2-A Sever-All. Screw-type and quick-action clamping also may be used interchangeably.

***Write for details** on the new Model 2-A Sever-All abrasive cutting machine. Ask for Bulletin DH-299*

ACCO

SEVER-ALL ABRASIVE CUTTING MACHINES

Allison-Campbell Division, American Chain & Cable Company, Inc.

925 Connecticut Avenue, Bridgeport 2, Conn.

For More Information Circle No. 11 on Reader Service Card.

when this baby needs new shoes . . .

REBUILD THEM FASTER . . . MORE ECONOMICALLY WITH

MANGANAL®

11¾-13½% MANGANESE-NICKEL STEEL

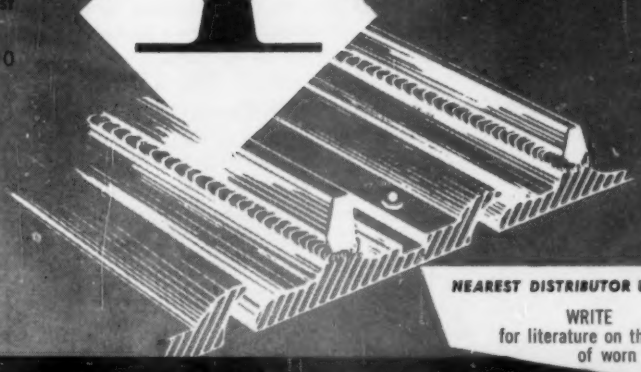
TRACTOR GROUSER BARS

- Greatest toughness, highest strength.
- Workharden up to 500 Brinell.

TRACTOR GROUSER BARS

HIGH CARBON STEEL

- Attached quickly with any good grade of low hydrogen electrode.
- Easy to use with any manual or automatic electric welding method.



NATIONAL WELDING SUPPLY ASSOCIATION MEMBER

NEAREST DISTRIBUTOR UPON REQUEST

WRITE
for literature on the reclamation of worn tractor parts.

STULZ-SICKLES CO,

929 Julia Street • Elizabeth, New Jersey

For More Information Circle No. 60 on Reader Service Card.

Welding industry mourns passing of two welding pioneers

MILLS

TINNON

THE WELDING INDUSTRY is mourning the passing of two of its pioneers. Ellsworth L. Mills, vice president and a director of the Bastian-Blessing Co., Chicago, died suddenly of a heart attack on Sunday, December 6; he was 72. John B. Tinnon, retired vice president in charge of sales, Metal & Thermit Corp., died November 30 in New Rochelle, N. Y.; he was 74.

ELLSWORTH L. MILLS

Ellsworth L. Mills was known as "The Colonel" to business associates, customers and friends in the liquefied petroleum and high pressure gas industries served by his company. At the time of his death, he had served over 20 years as a vice president and director of the Liquefied Petroleum Gas Association, which he was instrumental in founding, and was serving as a vice president and director of the LP-Gas Council.

Colonel Mills was a founding director of the American Welding Society, past president and director of the International Acetylene Association and past president of the Gas Products Association.

He was born in Denver, Colorado, and was graduated with a Bachelor of Science degree in Civil Engineering from Cooper Union Institute in 1910. In 1919 he joined Bastian-Blessing as sales manager of the one man department which was to become the Rego Division.

During the course of his 40 years with Bastian-Blessing, Colonel Mills had made innumerable contributions to the liquefied petroleum gas industry.

JOHN B. TINNON

A native of Fort Worth, Tinnon graduated from Vanderbilt University in 1908. From 1912 he was associated with the Chicago and Joliet Electric Railway Company, becoming chief engineer.

In 1924 he joined Metal & Thermit Corp., New York, and subsequently became sales manager. In 1944 he was elected vice president in charge of sales, which position he held until his retirement in 1955.

During World War II, Mr. Tinnon worked with the Government on the development of new types of welding electrodes. He directed the program under which nearly all the stern frames of Victory and Liberty ships were welded by the Thermit process.

For many years, he was an active member of the American Welding Society, serving on numerous committees and on its Board of Directors. He also was a member of the American Transit Association, American Railway Engineering Association, and the National Electrical Manufacturers Association, where he was chairman of the welding section and a member of the Board of Governors.

COMING EVENTS

January 18-20: Annual Meeting, Compressed Gas Association, Waldorf-Astoria Hotel, New York City.

February 3-4: Midwest Welding Conference, Armour Research Foundation of Illinois Institute of Technology, Chicago.

April 25-29: Annual Meeting and Welding Exposition, American Welding Society, Los Angeles.

May 5-7: Annual Convention, National Welding Supply Association, Palmer House Hotel, Chicago.

May 9-10: Annual Convention, International Acetylene Association, San Francisco.

May 9-13: 2nd Southwestern Metal Congress and Exposition, American Society for Metals, Dallas, Texas.

October 13-15: Western Welding Technical Conference and Welding Show, Santa Clara Valley Section, AWS, San Jose, Calif.

About CGA

by C. E. MONLUX
president
Compressed Gases Association

Soon after your mailman delivers this magazine, the Annual Meeting of the Compressed Gas Association will take place. This year the meeting will be held from January 18-20 at the Waldorf-Astoria hotel in New York.

As we look forward to the meeting, and a bright future for the compressed gas industry, let's pause for a moment and examine the purposes of the Association and look back across the years at the CGA's history to see what the organization has done for the welding industry. Incorporated as a non-profit technical organization in 1913, the CGA was an outgrowth of several organizations which were engaged in, or interested in, the compressed gas industry. The association has become well known to both industry and government for its work in the public interest during the ensuing 46 years.

The primary purpose of the organization is to promote, develop, and co-ordinate technical activities in the compressed gas industries, in an effort to increase safety and efficiency. If activities of the CGA, could be summarized in one word, that word would be "safety".

In addition to our interest in safety, we gather and publish scientific and technical information relating to compressed gases. We aid and counsel local and federal authorities in the preparation of laws or regulations pertaining to compressed gases. One of our chief interests is to develop standards for compressed gas containers and connections, and to

continued on page 80

ARE YOU A MULTI - BUNDLE BUYER?

Think of the poor fellow who buys a shirt from one store . . . a suit from another store . . . and a topcoat and a pair of shoes from still a third. His bundles grow; invoices, statements and receipts from so many sources multiply his paper work; and delivery dates are uncertain.

Liquid Carbonic eliminates multi-bundle buying in the welding field—by providing a full line: welding and cutting equipment, industrial gases, accessories for gas and arc welding and all other welding supplies. Our principle of single-source supply makes shopping easier, less expensive for you!

Have your Liquid Carbonic representative show you his "Case of Jewels"—a handsome display of precision-made Liquidweld torches and regulators. Ask him, too, about any Liquidweld equipment or supplies you may need.

INDUSTRIAL GASES, LIQUEFIED AND GASEOUS

Oxygen	*Welding Grade CO_2*
Argon	*Acetylene (gaseous only)*
Nitrogen	*Hydrogen (gaseous only)*

Write today for free illustrated literature on Liquidweld apparatus . . .

Never a Worry About Supply or Delivery

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Dept. WDF, 135 South LaSalle Street
Chicago 3, Illinois
In Canada: Liquid Carbonic Canadian Corporation, Ltd., Montreal 9, Quebec

For More Information Circle No. 46 on Reader Service Card.

A Deep Deep Cup for Extra Side Protection ...8 Big Indirect Ventilation Ports for Comfort!

This light, comfortable, flexible mask goggle is American Optical's latest for welders. The large face mask and deeper cup not only provide greater protection than ever but easily fit over prescription glasses. Lens adapter is black, flame-resistant nylon. Takes our standard lens ring and regular 50 mm. round filter lenses and cover lenses. Rings and lens adapter are quickly replaceable. Noviweld filter lenses, shades 3, 4, 5, 6 protect against dangerous rays, glare, sparks and scale. Companion Chippers' Goggle is No. 489A.

It Has Protected Tens of Thousands of Eyes!

Over the years, this favorite has protected the vision of many a welder from the hazards of light rays, sparks and metal splashes. Side shields are engineered for ample (indirect) ventilation while fogging is controlled. Individual eyecups shaped to fit each eye are low set for wide vision. They won't conduct heat. Insulated ball-chain bridge is quickly adjusted. One-piece rubber headband. 50 mm. Noviweld or Filterweld lenses, shades 3, 4, 5, 6 or 8. Or Noviweld-Didymium lenses, shades 3, 4, 5, 6 for absorbing yellow sodium flare.

NOTE: Keep 'em clear with SUPER-CLEAR! AO 350 AF Super-Clear Lens Cleaner and Anti-Fog Fluid keeps glass and plastic clean and fog-free longer. Just spray it on and wipe it off. Test it and you will accept no substitute.

YOUR NEAREST AO SAFETY PRODUCTS REPRESENTATIVE CAN SUPPLY YOU

American Optical COMPANY
SAFETY PRODUCTS DIVISION
SOUTHBRIDGE, MASSACHUSETTS

Always insist on Trademarked Safety Products

Safety Service Centers in Principal Cities

For More Information Circle No. 13 on Reader Service Card.

GOLD STAR SR

This d-c rectifier type welder does more things better than any other welder of its class because —

a. Its new transformer (Miller designed and built) has integral flux diverter.
b. Its new weld stabilized circuit delivers the ultimate in speed of metal deposition.
c. Its new completely sealed semi-metallic rectifier — designed for welding — provides the most efficient d-c for welding ever devised.

These features contribute to the Gold Star SR's greater arc stability, denser welds, easy arc starting and flexibility to handle all electrodes in all positions.

Performance-proved wherever profits are important, the Gold Star SR is available in single and duplex models of 200 to 1200 amperes at 60% duty cycle ratings.

" . . . if it's MILLER you know it's the finest . . ."

GOLD STAR *All-Weather* SRH

The features that set the SR above and beyond the normal standards of welder performance belong to the SRH also. But, in addition to the horizontal design for easier stacking and paralleling, this welder has an "all-weather" construction that includes baked varnish coated transformers and rectifiers plus phosphatizing and painting of all base and sheet metal — even fan blades. Cam-Lok receptacles are standard equipment. The Gold Star SRH welds real well.

Complete specifications on these Gold Star models will be sent promptly.

miller Electric Manufacturing Company, Inc., APPLETON, WISCONSIN

EXPORT OFFICE: 250 West 57th St., New York 19, N.Y. • Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal

For More Information Circle No. 51 on Reader Service Card.

MEETS RIGID SPECIFICATIONS

HARRISBURG CYLINDERS

Among the many reasons for longevity and dependability of Harrisburg cylinders are the rigid tests and inspections to which the cylinders are subjected.

For example maximum control of cylinder wall thickness is attained through the use of an XactRAY Gauge. This instrument is used to measure wall thicknesses throughout the length of the cylinder shell. In addition to the XactRAY gauge; Vidigages, Sonigages and Magnaflux Testing are available for use as required.

These instruments, of course, are supplementary to exhaustive I. C. C. inspections and tests which make possible effective control of wall thickness for minimum weight consistent with maximum service life.

More than a Century in Harrisburg 25, Pa.

H HARRISBURG STEEL CO.

Division of HARSCO CORPORATION

TUBES TRANSPORTS FLANGES COUPLINGS

For More Information Circle No. 36 on Reader Service Card.

MEN ON THE MOVE

in the welding industry

STONAGE

STOCKINGER

PROMOTIONS:

Richard S. Stonage has been named product manager for welding wire and stainless wire at *Page Steel & Wire Division, American Chain & Cable Co., Inc.*, Monessen, Pa., He succeeds **V. H. Godfrey** who is retiring.

Fred C. Stockinger is the new sales manager at *Bay State Abrasive Products Company*, Westboro, Mass. He had been assistant sales manager since 1958.

STANYON

GIBBONS

APPOINTMENTS:

Harry L. Stanyon has joined the sales department of *Fibre-Metal Midwest, Inc.*, in Chicago. He will call on welding and safety distributors in Michigan, Wisconsin and Illinois.

United Specialties, Inc., El Dorado, Arkansas, has announced the appointment of **James A. Gibbons** as regional sales manager for the territory from Chicago south to the Indiana and Ohio state lines and east to the New England and Atlantic States.

continued on page 18

Circle No. 34 on Reader Service Card.→

HARDSURFACING — FIELD REPAIR

quick, easy, economical with P&H welders and electrodes

High-speed hardsurfacing and fast field repair are two jobs you can handle easily and cheaply with P&H engine-driven welders and P&H hardsurfacing electrodes.

The sturdy wheel- or skid-mounted welders can go anywhere in the field — take plenty of hard knocks — and still do a bang-up job with big, high-deposit rods. P&H machines are powered by field-proved gas or diesel engines famed for their economy. They not only have a miser's grip on the fuel line, but they are more rugged and easier to service.

P&H hardsurfacing electrodes can be used to prevent wear and to prolong the service life on valuable equipment. What's more, hardsurfaced parts will in most cases outlast the original parts by two to twenty-five times!

Investigate both. Write for Bulletin W-158 which describes the welders — and Bulletin R-27 for information on the hardsurfacing electrodes.

P&H

HARNISCHFEGER

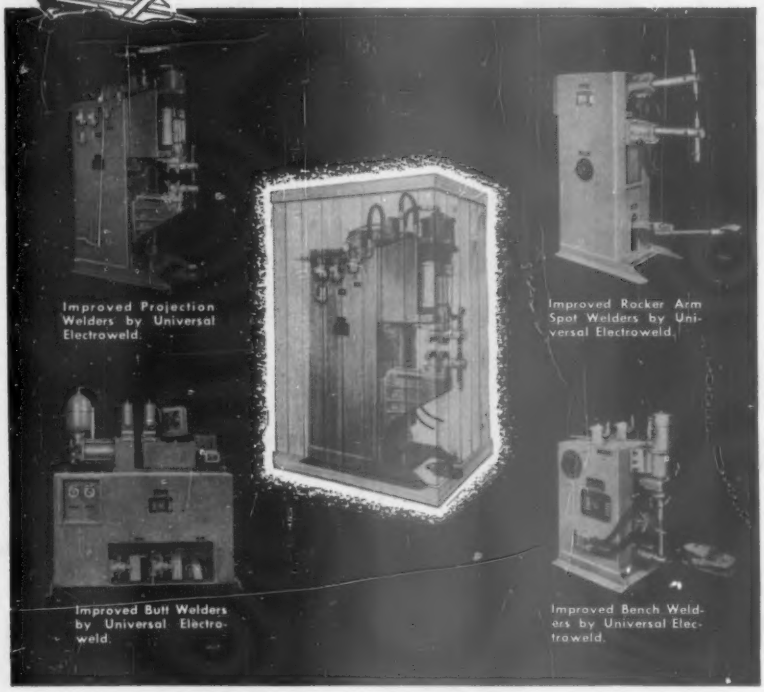
WELDERS • ELECTRODES • POSITIONERS

MILWAUKEE 46, WISCONSIN

316

P&H welding equipment is manufactured and sold in Canada by REGENT EQUIPMENT MANUFACTURING CO., LTD., 455 King St. West • Toronto, Ontario, Canada.

Profit through E.A.I. Research


Improved Projection Welders by Universal Electroweld.
Improved Rocker Arm Spot Welders by Universal Electroweld.
Improved Butt Welders by Universal Electroweld.
Improved Bench Welders by Universal Electroweld.

in ready-to-use packages . . . a

WELDING BREAKTHROUGH

• More Versatile and Durable Resistance Welders at Major Savings!

Welders made for a quarter-century of high production without major repairs . . . rams that never need replacing . . . Lineal Ball Bearing sleeves instead of cam rollers . . . *Heat-Vector*® control that brings 3-phase welding performance to single phase welders . . .

These are some of the advances that come packaged in today's new Universal Electroweld Single Phase Welders . . . the most practical ever developed for resistance welding. They bring new flexibility and precision to resistance welding . . . with major savings on your initial investment . . . reduce installation, maintenance costs.

RENTAL AGAINST PURCHASE . . . an easy way to see for yourself how you can gain by using Universal Electroweld Resistance Welders.

Write for brochure, *"NEW PACKAGED WELDING ADVANTAGES."*

DEMAND THE BRAND MADE BY PEOPLE WHO BUY YOUR PRODUCTS

UNIVERSAL ELECTROWELD DIVISION
Electric Arc, inc.
152—2 Jelliff Ave.
Newark 5, New Jersey

ELECTRIC-ARC INC.

For More Information Circle No. 25 on Reader Service Card.

MEN ON THE MOVE

continued from page 16

MILLER

AUKER

ELECTIONS:

Niels C. Miller, president and founder of the *Miller Electric Mfg. Company,* Appleton, Wisconsin, was recently elected to the Board of Governors of the *National Electrical Manufacturers Association on (NEMA).* He will represent the Arc Welding Section on the Board for three years.

Elden L. Auker, vice president-marketing, *Bay State Abrasive Products Company,* Westboro, Mass., was reelected Chairman, Board of Directors, of the *Grinding Wheels Institute* at that group's annual meeting held late last year.

LIVINGSTON

Ira R. Livingston has been elected vice president in charge of sales at *Chemclean Products Corp.,* College Point, N. Y. Mr. Livingston has been with Chemclean for eight years, in both administrative and sales capacities.

RETIREMENTS:

George A. Park has retired as sales manager of abrasives at *Norton Company,* Worcester, Mass., after a business career of 50 years. On completion of 40 years of service, he received a certificate from the Grinding Wheel Institute in recognition of his years of service.

turn to page 72
for news about new products

Wear-O-Matic Hard Surfacing is 3 Ways Better

1 *Faster . . . More Economical*

The Wear-O-Matic process of semi-automatic hard surfacing is continuous welding with manual control of the arc. However, unlike manual welding with stick electrodes, there is no time consuming slag cleaning or electrode changes. Higher deposition rates, 3 to 5 times faster than stick electrodes, greater deposition efficiency, 85 to 95%, plus more available arc time add up to savings of 40 to 50% over manual hard surfacing with stick electrodes.

2 *Uniform Resistance to Wear*

The superior wear resistance qualities of Wear-O-Matic hard surfacing wires is the result of closely controlled manufacture, properly balanced alloys and fluxing agents, and precision drawing. Wear-O-Matic 7/64″ diameter open arc wires are precision drawn to true wire diameter ± 0.002″ and through drawing are densely compacted assuring an easier feeding wire that will not crush in the feed rolls or bind in the feed cable. Dense compaction and closely controlled fabrication combine to provide a weld deposit more uniform in chemistry and metallurgy resulting in uniform hardness and greater wear resistance throughout the deposit.

3 *Greater Efficiency and Ease of Application*

Here's a hard surfacing combination *designed* to cut maintenance cost through the *profitable* utilization of your welder's time. Wear-O-Matic wires in WELD-PAKS are the key to greater efficiency of both semi-automatic equipment and operator. Each WELD-PAK contains 100 pounds of wire packaged in a "dead cast" resulting in tension free, snarl free feeding. Because the WELD-PAK contains 2 to 4 times more wire than standard coils, the amount of time spent handling wire is lessened, providing more time for welding. WELD-PAKS are easier to handle and store; and on the job, the lid can be replaced after use assuring dirt and dust free wire when you are ready to resume welding. From set-up to finished job, the Wear-O-Matic process is easier and faster, eliminating overtime or providing more time for other maintenance jobs. Job test this time saving process in your own shop. Request Bulletin HS-1TC for complete details. Alloy Rods Company, P. O. Box 1828, York, Pennsylvania.

Wear-O-Matic Wire Feed Unit
$279.00 f.o.b. York, Penna. or El Segundo, Calif.

Weld-Pak is the trade name for this exclusive Wear-O-Matic package.

Alloy Rods Company

YORK, PENNSYLVANIA • EL SEGUNDO, CALIFORNIA

QUALITY WELDING ELECTRODES FOR

- Stainless Steel
- Low Alloy Steels
- Cast Iron
- Tool Steel
- Bronzes & Dissimilar Metals
- Hard Surfacing Electrodes & Wires

NO FINER ELECTRODES MADE . . . ANYWHERE

For More Information Circle No. 12 on Reader Service Card.

Photo courtesy Caterpillar Tractor Co.

For Speed and Economy in Flame Cutting Using Natural Gas

The use of Harris cutting torches accomplished the most economical balance between cutting speeds and oxygen consumption. Harris torches were selected over competing brands.

This installation permitted performance not otherwise possible and the gas savings are substantial.

For further information call your local Harris Distributor or write to us.

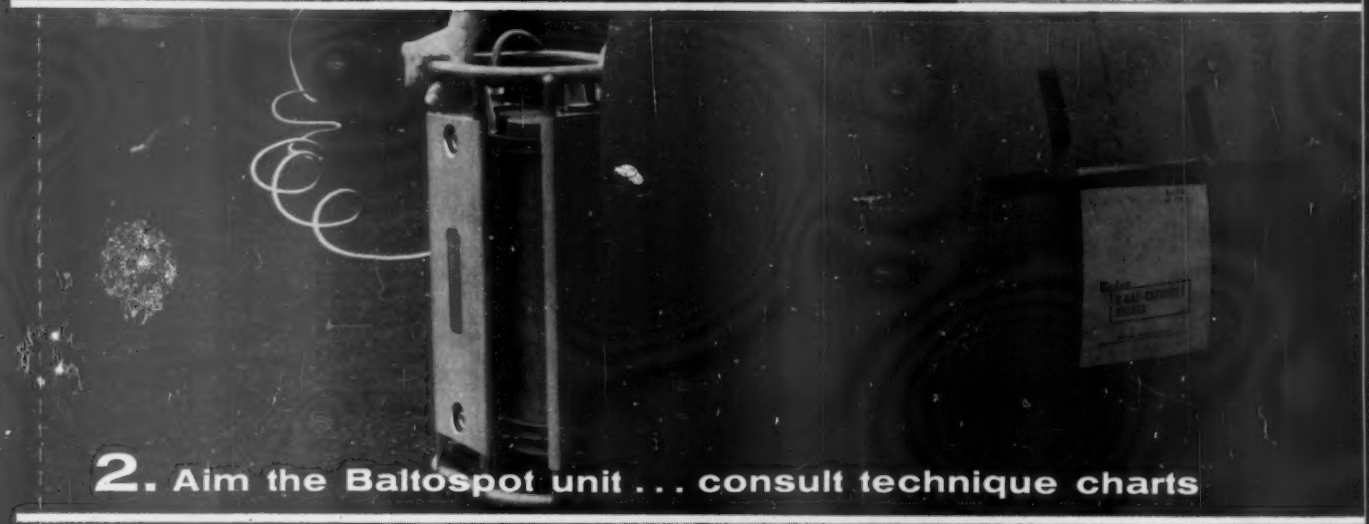
HARRIS

HARRIS CALORIFIC CO.

5501 CASS AVE. • CLEVELAND 2, OHIO

For More Information Circle No. 35 on Reader Service Card.

1. Attach the film holder



2. Aim the Baltospot unit . . . consult technique charts

3. Set the controls . . . press the button!

YOU'VE JUST MADE A WELD X-RAY!

Taking repetitive or field X-rays is a 1-2-3 operation with this Baltospot portable unit—can be learned in less than a day. You simply carry the unit to the job, X-ray the weld, and develop the film—all in a matter of minutes.

And don't forget—X-ray weld inspection is a real cost-cutter, too (77% savings on inspection were recently reported by a prominent tank fabricator).

For the whole story, contact your nearby Westinghouse X-ray sales representative. Or write: Westinghouse Electric Corporation, X-ray Department, 2519 Wilkens Avenue, Baltimore, Maryland. J-06378

For More Information Circle No. 69 on Reader Service Card.

YOU CAN BE SURE...IF IT'S

Westinghouse

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NEW NEW NEW NEW NEW NEW NEW NEW NEW

WHEN IT

MELTS

you know the *temperature!*

the easy modern way to determine exact working temperatures!

Just mark or stroke the surface with THERMOMELT . . . when it reaches the desired temperature, the mark liquefies. There's no guesswork, no wasted time or material . . . THERMOMELT is the quick, precise way to determine heating temperatures. Accurate to within ±1%.

A STIK FOR EVERY TEMPERATURE from 113°F. to 2000°F.

ALSO AVAILABLE IN LIQUIDS AND PELLETS for inaccessible or hard-to-measure applications. Wide range of temperatures.

Send today for free THERMOMELT literature and pellet sample (indicate temperature desired).

MADE BY THE MANUFACTURERS OF MARKAL PAINTSTIK MARKERS AND PROTECTIVE COATINGS

MARKAL COMPANY 3063 West Carroll Avenue, Chicago 12, Illinois

For More Information Circle No. 48 on Reader Service Card.

LIBRARY

of welding

High-Strength Steel Filler Wires

"Development of High-Strength Filler Wires for Welding SAE 4130, 4140 and 4340 Steels." H. W. Mishler and R. P. Sopher, Battelle Memorial Institute for Wright Air Development Center, U.S. Air Force, April, 1957, 76 pages. (Order PB 131074 from OTS, U.S. Department of Commerce, Washington 25, D.C., $2.00)

Filler wires for welding high-strength low-alloy aircraft steels by the inert-gas tungsten-arc and inert-gas consumable-electrode processes were developed. Two filler wires were products for welding each of three steels: SAE 4130, 4140 and 4340. One of each pair of filler wires had a composition similar to the base material, while the other was different.

Sound, crack-free welds, heat treatable to 200,000 psi, were placed under a high degree of restraint with all wires. Best results were obtained with filler wires of compositions similar to the base material. Although, satisfactory welds were also made at most of the strength levels with wires of different compositions.

The major factors considered in the evaluation and development work were weld-metal porosity, weld-metal cracking tendency, heat treatment response compared with base metal, strength of heat-treated weld joint, weld-metal toughness and weld-metal hardening ability.

Revised Filler Metal Comparison Charts

American Welding Society, Department T, 33 West 39th Street, New York 18, New York; 48-pages, $2.50.

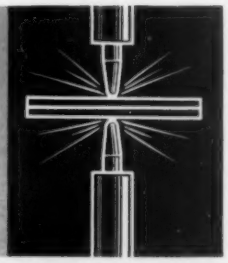
The publication of a newly revised 8½- by 11-inch, 48-page booklet said to contain the most complete welding rod and electrode comparison charts ever published has been announced by the American Welding Society. The brand names of 78 companies are listed. Fifteen AWS-ASTM specifications are covered. Brands as well as manufacturers names are contained in two indexes.

P.R. MALLORY & CO. Inc.

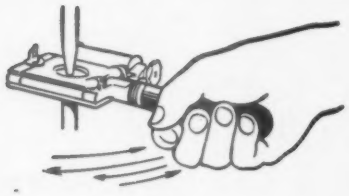
MALLORY MEMOS

NEWS AND TIPS ON RESISTANCE WELDING

Mallory Metallurgical Company, Indianapolis 6, Indiana

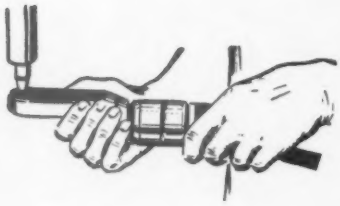


WELDING HINTS

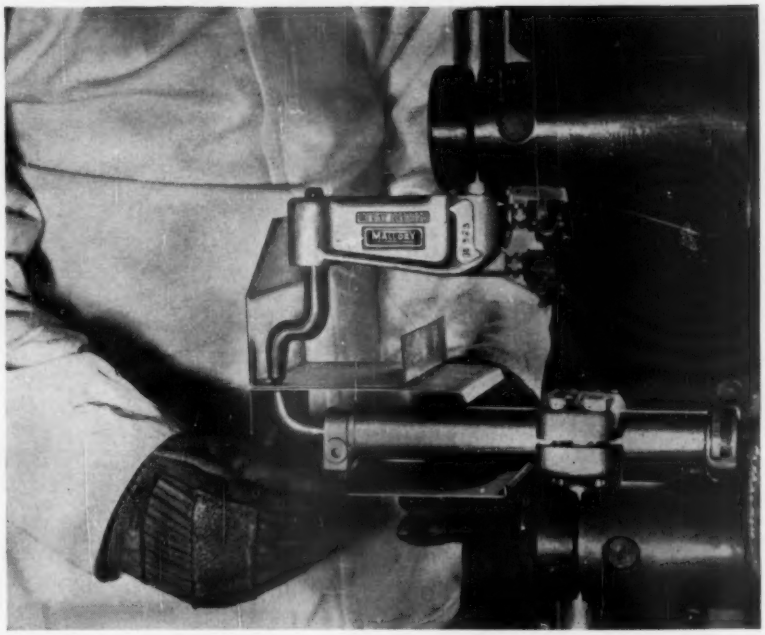


Dressing radius faced electrodes on the machine saves time, keeps electrode face contours correct. The "Maintain-A-Contour" Electrode Dresser provides convenient, inexpensive manual dressing for tips of any radius, with quick, easy change-over from one radius to another.

Dressing dome or pointed electrodes also can be handled "on-the-job". The Mallory Electrode Dresser quickly remachines both upper and lower electrodes to the correct profile—provided both are identical—without removal from holders.



For more frequent dressing, a power-driven dresser can return sizable dividends through reduced down time. The Mallory Pneumatic Electrode Dresser speeds accurate dressing of electrodes to flat, radius, dome or truncated contours. Requiring only ¾" clearance, it can dress most electrodes on the machine.



"Special" weld set-ups are easy...*with*

STANDARD MALLORY COMPONENTS

Take a problem like welding inside a channel. It looks "special," but it's a cinch with *standard* Mallory parts. A 500 Series ejector type offset holder with a double bend electrode is mounted on the upper arm. A 100 Series straight holder with standard "T" connection, standard adaptor and single bend electrode is mounted on the lower arm.

No matter what kind of a welding job you're tackling . . . flat pieces, inside joints, tight corners, tricky configurations . . . you can find *standard* Mallory parts to make the set-up, quickly and economically.

The more than 200 standard Mallory electrodes include straight, single bend, double bend and irregular styles in a variety of nose shapes and materials. The Mallory selection of holders covers straight, universal, heavy duty, paddle and low inertia models. Add them together and you've got literally thousands of combinations to fit practically any welding problem.

You'll get longer service and more consistent welds from Mallory single bend and double bend electrodes with the bent-in-place cooling tube,* which cools right to the electrode tip. More efficient cooling at no extra cost.

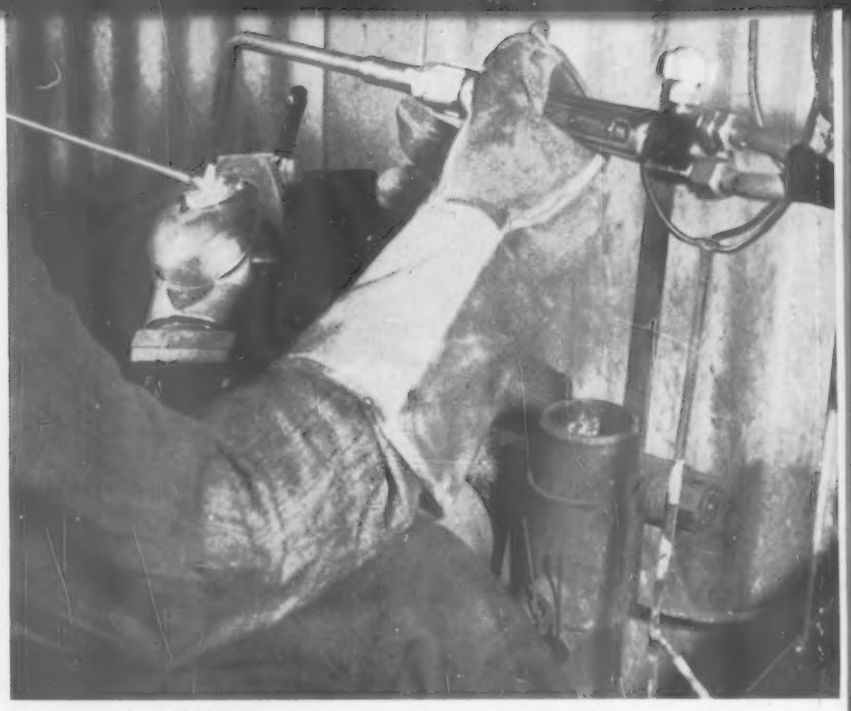
*U. S. Patent 2,489,993

MALLORY RESISTANCE WELDING PRODUCTS ARE AVAILABLE FROM AUTHORIZED DISTRIBUTORS LOCATED IN ALL PRINCIPAL CITIES

For More Information Circle No. 47 on Reader Service Card.

WELDING AT WORK

to do the job better and cheaper



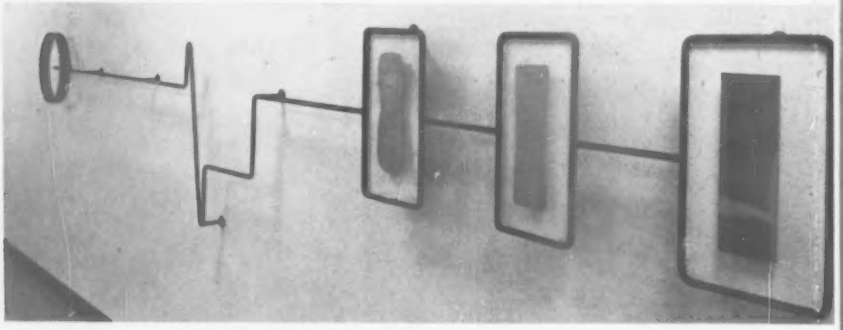
OXY-ACETYLENE FLAME is used to surface valve core seating surface.

Thin layer of cobalt-base alloy protects

TULSA, OKLAHOMA: Hard facing gives a valuable assist to a valve that incorporates the closing features of plug, gate and globe valves. A thin but tough, ductile cobalt-base alloy deposit protects the core seating surface.

Orbit Valve Company makes this valve for oil field, chemical and petrochemical applications. The valve core is forced directly into the seat instead of being revolved or slid into place. This closure method develops pressure and impact, rather than sliding friction. In order to protect the seating surface of the core, Haynes Stellite alloy No. 6 or No. 12 is applied

Welded abstract design decorates office wall



CHESTNUT HILLS, MASS.: A welded abstract design decorates the corridor wall of the new office of James Thomas Chirurg Company. This advertising agency uses the abstract to tell a story: "The Resolution of an Idea." The idea germinates in the brain cell (circle at left) then goes along until it takes a positive upturn. It is then regarded negatively and slides down (diagonal line at center) but positive thinking prevails and the idea proceeds to the rough stage (untrimmed, unpolished aluminum plate) to partially complete stage (partly trimmed and polished plate) to final stage (trimmed plate with high polish).

The abstraction was designed and fabricated by Geoffrey Bruce, a student at the Rhode Island School of Design, on commission for Bruce-Babel Associates of Framingham, Mass., interior designers.

SURFACED valve cores are ground before installation.

HARD FACED cores are used in oil field valve

valve core seating surface from wear and corrosion

to a finished depth of only 1/32-inch. This thin layer provides the added advantage of being extremely corrosion-resistant.

The valve cores are preheated to above 800°F before hard facing. Then, ¼-inch bare rod is applied manually on a revolving jig using an oxyacetylene flame. An alloy band one-inch wide and 3/32-inch deep is deposited on the core of a 4-inch valve in about 20 minutes. A special automatic grinder finishes the deposit. The resulting seating surface is spherical. The finished deposit is about 1/32-inch thick. Valves range in size from one- to 6-inches. Alloy No. 6 is used on cores of forged steel or Type 430F stainless for lower pressure valves. Alloy No. 12, which is more abrasion-resistant, is used on the same type of valves tested for pressures between 6,000 and 10,000 psi.

Special rig speeds bridge welding

SIDNEY, OHIO: A flat bed semi-trailer, outfitted with six Hobart 300 ampere engine-driven welders which operate on LPG from a central fuel system, is the latest innovation of Don R. Fruchey, president of Don R. Fruchey, bridge welding and steel erecting contractor of Ft. Wayne, Indiana.

For several years, Fruchey had been using an enclosed semi-trailer welding rig. In this one, he used eight Hobart 300 amp electric motor-driven welders powered by a Diesel (converted to LPG) engine-driven 125 KW AC generator. The trailer was backed up to the job and welding cable strung out from the back.

The new flat bed trailer is lighter, more maneuverable and it is easier for the six operators to string out their cable from the trailer's side. Each of the six engine-driven welders has an LPG carburetor.

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NEW AC INDUSTRIAL *PORTARC 205*

DELIVERS FULL POWER *ANYWHERE...* AT LOW, LOW COST

- **HIGH OUTPUT**— 60% duty cycle at 205 amps heat setting . . . maximum of 80 O.C.V. . . . 6 conveniently located heat taps from 135 through 205 amps.
- **LIGHTWEIGHT**— only 70 lbs. . . . one man can carry it anywhere.
- **VERSATILE**— for production welding or tacking . . . ideal for industrial or commercial welding applications.
- **LOW COST - HIGH VALUE**— sells for less than half the price of other industrial welders with equivalent rating.
- **OPTIONAL FEATURE**— Low open circuit voltage feature optional on 460V models.
- **EMERSON - ENGINEERED TO LAST**— all units quality constructed . . . backed by famous Emerson Electric guarantee.

A COMPLETE LINE FOR MOST WELDING NEEDS

90 AMP	180 AMP	180 AMP	295 AMP	200 AMP DC
Light Duty	Medium Duty	PORTARC	Heavy Duty	Gas Engine Driven

See your local Emerson Electric Welder Distributor or Write Dept. W534 Today for Specifications and prices!

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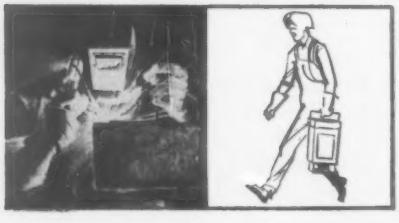

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150 pounds 300 KV

The Revolutionary Baltograph 300

This remarkable unit represents the greatest single forward step in industrial radiography in many years. The Baltograph 300 . . . for the first time . . . combines a power rating of 300 KV and penetration capability of 4" of steel while weighing only 150 lbs. . . . a new low for x-ray equipment in the higher power ranges.

From thin walled aluminum and magnesium castings x-rayed in the plant to heavy weldments x-rayed in the field, the Baltograph 300 is capable of handling them all. The inefficiencies of "part-time use" equipment, limited in application and scope, can now be eliminated.

For a free demonstration on your work . . . at your plant or on the job-site . . . write, call or wire collect today:

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Stamford, Conn.

Balteau

Speaking of *"Pencils"*...Look what's happened to the TEC Pencil Torch!...

Sounds unbelievable, but TEC'S done it again! Developed an off-set transparent Gas Nozzle and a "non-slip" off-set chuck which converts the famous TEC Pencil Grip Torch into a miniature 300 Amp 45° or 90° Angle Torch in seconds! . . . And WELDS IN 1½ INCHES OF SPACE!

NOW WELD IN NORMALLY INACCESSIBLE AREAS WITH THOSE FAMOUS TEC FEATURES:

"TIP-OF-THE-TORCH" COOLING SO YOU WELD CONTINUOUSLY AT 300 AMPS!
Continuous coolant water reaching the tip of the torch affords cool, continuous welding at 300 amps.

GUARANTEED GAS AND WATER LEAKPROOF!
One-piece unit torch head without threaded fittings or gaskets to wear or leak eliminates gas and water leakage.

UNPARALLELED MANEUVERABILITY!
Lightest weight, only 3 ounces, fine balance and miniature head mean exceptional handling in only 1½ inches of space.

MAINTENANCE ELIMINATED!
Simplicity of design with no moving parts eliminates replacement parts. Quality workmanship assures years of service.

Off-set Nozzle
Off-set Chuck ®
A durable, Vycor nozzle, transparent so you SEE WHAT YOU WELD coupled with an easy adjusting "non-slip" chuck.

SPECIFICATIONS

OVERALL LENGTH— 8¼ in. with 45° Nozzle 8 in. with 90° Nozzle	WORK RANGE— 3 to 300 Amps Continuous Cycle
WORKING WEIGHT— 3 ounces	HANDLE DIAMETER— 1 inch
HOSE LENGTH— 12½ feet	EXTRA LENGTH AVAILABLE 25 feet

NOZZLE SUPPLIED — 45° or 90°, Vycor,® 3 in. orfice extension available

® Vycor is a registered trade name of Corning Glassworks, Inc.

Contact your local distributor or write direct:

TEC TEC TORCH COMPANY, INC., CARLSTADT, N. J.
MANUFACTURERS OF VISUWELD EQUIPMENT

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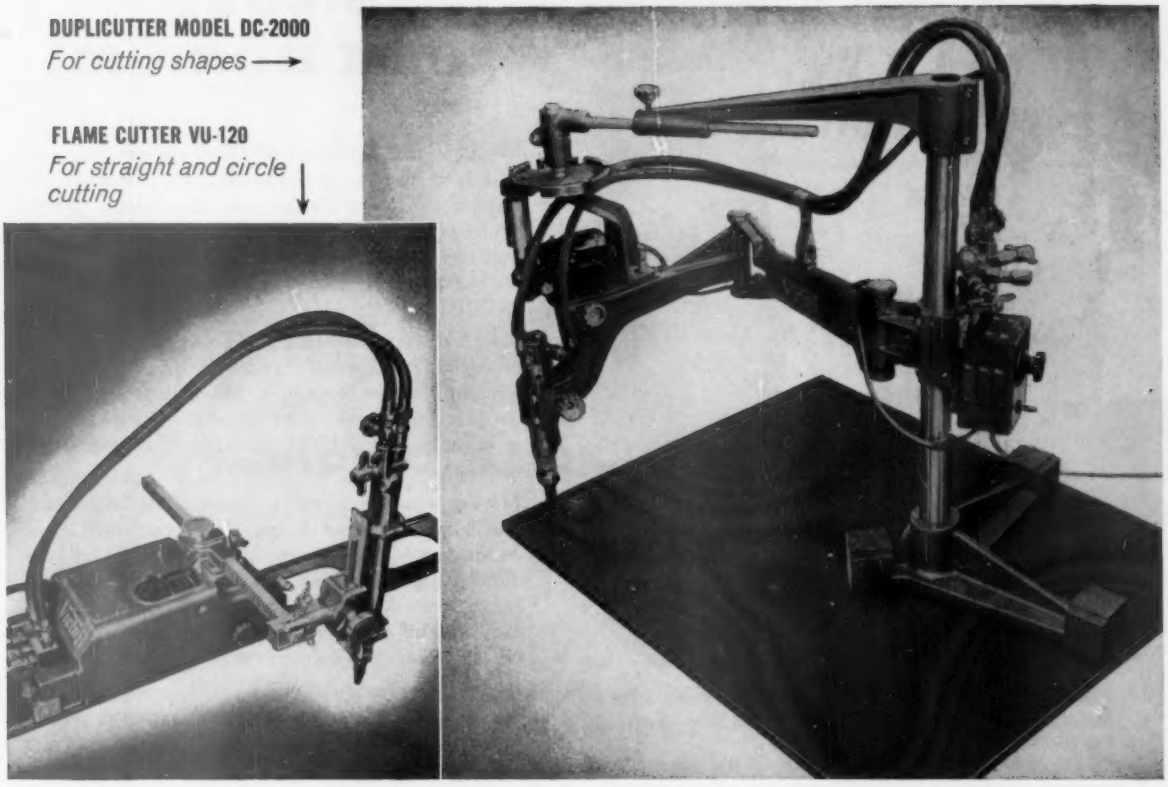
SPEED YOUR PRODUCTION

with these Victor Cost-Cutters

DUPLICUTTER MODEL DC-2000
For cutting shapes ⟶

FLAME CUTTER VU-120
For straight and circle cutting ↓



Victor Flame Cutter, Model VU-120

- Cuts straight lines, square or bevel kerfs, circles to 96" diameter
- Adaptable to submerged or inert arc automatic welding.
- Travels 0 to 180" per minute forward or reverse; variable speed transmission provides full power over entire range.
- Free-wheeling neutrai for easy positioning.
- Accommodates both 2 and 3-hose torches, with or without gear rack.
- Second torch holder available for parallel cutting.

Victor Duplicutter, Model DC-2000

- Duplicates shapes up to 19½" diameter circles, 12" x 35" rectangles.
- Holds tolerances of plus or minus 1/64" in 2" steel.
- Templates easily changed, making practical both long runs or a single copy.
- Weight, 36 lbs. — easily carried.
- Magnetized feet set on stock being cut — no levelling needed.
- Uses Victor cutting tips thru size 5.

To see how Victor Cutting Machines can speed your production, ask your Victor dealer for a demonstration . . . or write us for descriptive Bulletin 353.

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Profitable dealerships open in a few areas; inquire now.

VICTOR EQUIPMENT COMPANY

Mfrs. of welding & cutting equipment; high pressure and large volume gas regulators; hardfacing rods, blasting nozzles; cobalt & tungsten castings; straightline and shape cutting machines.

56

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J. C. Menzies & Co., Wholly-Owned Subsidiary

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All Teeth Stay Sharper, Last Longer with

Stoody TUBE BORIUM!

ROAD RIPPER TEETH *averaged 7 to 10 times more life after receiving protection with Tube Borium. Notice how tooth chisels down with wear.*

Wear and loss of digging efficiency are common complaints on all types of teeth—*ditchers, power shovels, rippers, draglines, dredges, etc.* Hard-facing greatly prolongs useful life. But even so, each tooth can be made to last *far longer than ever before* and *retain its sharpness* by hard-facing with Stoody TUBE BORIUM!

Why is this one hard-facing alloy so superior on teeth? *No other hard metal equals TUBE BORIUM in straight abrasion resistance.* Its deposits are thickly peppered with tiny tungsten carbide particles. Wear is virtually defied by this hardest-of all man-made metals.

More expensive in first cost, Tube Borium shows excellent economy in overall service life, outlasting other materials many times over. And longevity is not your only benefit. Remember, one major cost of any hard-facing application is welding time. Use the best, Tube Borium, and you'll save several applications of less effective alloys besides eliminating needless downtime!

Your Stoody dealer (check the Yellow Pages of your phone book) will supply details, literature or recommendations. Ask about Tube Borium—or write direct.

SHOVEL TEETH *wore out in one 8-hour shift. A few beads of Tube Borium applied during noon break prolong life 6 or 8 full shifts. They are then repointed and hard-faced for further use.*

DRAG LINE TEETH *used in slag dump were hard-faced with Electric Tube Borium—outlasted unprotected teeth 9 to 12 times.*

TUBE BORIUM is available in stick form for oxy-acetylene or manual electric application. Also in continuous wires for automatic and semi-automatic electric application. Various mesh sizes for individual uses.

DITCHER TEETH—*A few ounces of 30-40 Electric Tube Borium on points of teeth increased life 6 to 8 times over factory originals.*

STOODY COMPANY

11982 East Slauson Avenue • Whittier, California

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JANUARY, 1960

Welding Design & Fabrication

ESTABLISHED IN 1930 AS INDUSTRY & WELDING

What Management Should Know About Automatic Welding Machinery

THE SCIENCE of automatic welding is the handling, positioning and manipulating of work pieces and welding equipment on an automatic basis, bringing them into proper relationship to one another for fusion.

To be truly automatic, equipment must function with the precision, range of motion, controllability and ruggedness expected of machine tools. While the machine tools for cutting operations are well known, the machine tools for welding are in a stage of change and are now just emerging from their earlier "tools and fixtures" category.

Currently, the Automatic Welding Machinery Association is drawing together the technical and management personnel of automatic welding machinery manufacturers to create uniform nomenclature, engineering standards and methods of equipment rating and to promote better understanding of such equipment.

As a further guide to this understanding of automatic welding machinery, WELDING DESIGN & FABRICATION editors interviewed both users and manufacturers of automatic welding machinery and asked them this question: "What should management know about automatic welding machines?" The answers appear on the next four pages . . .

What Users Look For In Automatic Welding Machines

WELDING DESIGN & FABRICATION went to typical midwestern plants to learn what the user looks for in an automatic welding machine . . . how a proposal starts, and how it is approved. We found that users make thorough searches, draw critical comparisons—even rate manufacturers—before they approve a machine's purchase. Here's what the user is up against . . .

■ Too low a budget to buy the best automatic welding machine. High engineering costs whittle welding budgets down. The result: performance and dependability may be sacrificed.

■ Users must know manufacturers—and rate them on: experience in the field, delivery, machine performance, and others.

■ Some automatic welders are fine for laboratory tests but fall down in continuous operation. The wrong power source can double fixturing costs.

■ It's easy to justify an automatic welder that is bought for a new product with potential; but it's hard to justify one to reduce costs through a change in process.

Here's what goes on behind the scenes at typical plants. These practices may give you money-saving tips.

- Product: **Auto Frames**
- Company: **Midland-Ross Corp.**

Daily shipments of carloads of auto frames means high production welding. Midland-Ross gets that kind of production with carefully selected automatic machines.

Welding Engineer Gordon Richards, first finds out how much it would cost to weld a frame manually. He considers the number of stations, man hours, and productive material—and whether there is factory space. If the costs look high, he gets quotations for a machine to do the welding automatically.

When quotations are in, Richards rates the manufacturers' experience in the field, financial stability, delivery, year's volume, and machine performance, to name a few.

Then he holds a meeting of the heads of the engineering departments, manufacturing superintendents, and the division manager. They discuss quotations of the three companies that rate the highest and evaluate them in the light of each department's responsibility. Then they select the best automatic machine that the budget will allow.

Richards thinks that automatic manufacturers should pay particular attention to these points:

1. Equip machines with parts (like fittings and contacts) that will hold up in production.

2. Go slow in recommending the power supply. The wrong one could easily double fixturing costs by not giving the speed for which the tooling was designed.

- Products: **Aircraft, Nuclear, Automotive**
- Company: **Thompson Ramo Wooldridge, Inc.**

The welding engineering department determines when an automatic welding machine need be bought. Two or more engineers analyze prints on new jobs or review old ones to improve manufacturing methods.

The recommendation for purchase comes from the welding engineering department. In addition, the planning department is consulted on how the product is to be made and how it is to flow through the shop.

Thompson bought two cylinder welding automatic welding machines for versatility. Each could weld by submerged arc or inert arc processes. The machines could be paralleled or run separately. Each unit was equipped with a test circuit to check its operation before an arc was struck. A recorder was provided to spot a breakdown anywhere in the welding cycle—so that the trouble could be corrected at once. The machines were also equipped with turning rolls and positioners. They were also equipped for the addition of electronic contour-following heads.

At Thompson, a lot of people approve the recommendation to buy an automatic welding machine. And it isn't easy to get approval to buy capital equipment. Whenever possible, a unit they already have is used.

The welding engineer writes specs that the equipment must meet to do a new product. Thus, cost is not a big consideration. Thompson often picks a standard machine recommended by the manufacturers. If they feel that the standard won't do the job, they ask the manufacturer for changes. Thompson feels that their people know what's needed far better than the manufacturer—because they are closer to the design of the part and how it will be handled.

Automatic welding machines are not bought on the competitive bids at Thompson. When one is to be bought, they see machines in operation at other plants, then decide which they prefer and can use on a project.

After a machine has been bought it is put through its paces before it is released to production. If details need correction it is done at this time.

- Products: **Heat Exchangers, Boilers**
- Company: **Babcock & Wilcox Co.**

Where it can, B & W buys standard automatic welding machines and manipulators. But because so many of their weldments are special, the automatic welding machines to do them have to be special too. Usually B & W designs their special automatics. They are close to the problem and expert in welding techniques. Their lab is equipped to use any welding process.

The plant engineering department usually prepares a proposal for buying automatic welding machines. They prepare a purchase proposal which includes lab test results and the views of the product design, methods, accounting (and occasionally, other) departments. Top management okays the proposal if convinced that the savings are worthwhile and that the equipment will produce sound weldments fast enough.

B & W has had good experience with purchased automatic welding machines. The reason: the welding development group and plant engineering comb out bugs before the equipment is built or goes into production. A good part of their success comes from working closely with the vendor. Another part is shop follow up—to see that correct procedures are followed.

The price tag has a bearing on buying a machine, but it isn't everything. In a big project, automatic equipment may be the least expensive item, quality and performance being the prime concern. But if the job is a special and short run, the price tag is mighty important. There must be enough pieces; the machine cost must write off in a definite time.

- Product: **Earth-Moving Equipment**

A large manufacturer of earth movers buys automatic welding machines when: it creates a new product and there are many like parts to be welded, or when there is a money-saving process change.

Anyone in this company may suggest a process change. The process development department screens each suggestion, and sends those with merit on to the methods and standards departments. They figure standard hours and estimate savings. If the savings are real, process development digs into any remaining details.

The size of the project—in hard cash—determines who okays the buying the automatic machine. The plant manager, the director of manufacturing, or a v. p might do it.

If it's a matter of cost reduction, approval comes in months at this company. A tool-up for a new product might take years.

The automatic machine manufacturer is chosen from among up to five concerns asked to quote. High, medium and low prices are studied and each discussed with the submitter. This points up the reasons for the difference in prices and may suggest worthwhile machine features not considered in the buyer's specifications. They especially watch performance and maintenance details. If maintenance costs are high, savings —and profits—may quickly dissolve.

Before the company takes delivery on the machine it is thoroughly tested at the vendor's plant. If anything is overlooked during the planning stage, it will be detected and corrected here; most bugs will be gone before the machine is installed on the production line.

- Products: **Truck And Earthmover Rims**
- Company: **Goodyear Metal Products**

Maybe money can be saved by changing the welding process. Maybe closer tolerances, better quality, higher production are needed. Maybe a new product demands it.

One of these reasons lead to the purchase of an automatic welding machine at this division of Goodyear Tire & Rubber Co.

Often a standard automatic—or a modified one—will do the job. If not, Goodyear goes all out with a special machine.

Although the engineering group works up the recommendation to buy, foremen, superintendents, and engineers help shape it. One of them may have discovered the need in the first place.

They call the recommendation to buy, a budget request. It estimates savings (if there's a switch in processes) and gives production and quality figures. The engineering group does this alone if the job isn't too big. On a real big job, they get help. The methods, standards, efficiency, and accounting departments supply fully developed figures.

The chief engineer, superintendant, and general manager approve a budget request before it is submitted to the parent company management.

continued on page 66

6 Questions On Automatic Welding Machinery

LEADING MANUFACTURERS *of automatic welding machines developed this check list for readers of* WELDING DESIGN & FABRICATION. *Management will know all they need to about the automatic welding machines their companies are buying if they have their welding supervisors answer these questions:*

- Are our specifications complete and realistic? Are we specifying the proper degree of automation and flexibility? If we have contacted more than one prospective supplier, are all bids being made on identical specifications?
- Do we need lower-priced standard equipment to do many jobs or more expensive specialized equipment for a single job? Do we want a machine that is versatile enough for additional use after the present job is completed?
- Have we made sound comparative tests of the various competitive welding processes so we can select the most economical. Can the equipment be adapted for use with newer welding processes being developed continually?
- Are we aware that we can get full advantage from automatic equipment only when work procedures are carefully programmed and fitted with necessary jigs and fixtures? And, have we considered metal forming before welding and cleaning and work handling after welding.
- Are we getting an accurate, dependable machine which will require a minimum of service and maintenance?
- Can our supplier give us the necessary delivery. Do we realize that unrealistic delivery deadlines often increase equipment prices?

• Paul Galton, general manager,
• Ransome Company, Scotch Plains, N. Y.

"Management must be aware that today's automatic welding equipment is not a complicated monster. They should know it is usually very simple to operate and understand. Properly applied automatic welding machinery can cut fabricating costs upwards of 50 percent.

"But, management should realize that to get full advantage of automatic equipment, the work procedure must be programmed and fitted with the necessary jigs and fixtures.

"Automatic welding equipment today offers a wide range of capacities, speeds and controls so it is important that the buying public check their requirements against what is available. While the immediate desire may be to find a single purpose machine to do a given job, it is often wiser and sometimes less expensive when the choice is a multi-purpose machine which may be manufactured as a standard by more than one supplier."

• Maurice Sciaky, vice president
• Sciaky Bros., Inc., Chicago

"With profits harder and harder to earn, automatic welding equipment must be well conceived and developed if it's going to produce the desired results. This development begins in the proposal stages. Therefore, procurement policies that emphasize price and delivery instead, discourage the builder's investment in engineering his proposal. Obviously, his price is higher if he does more than his competitors. His loss includes the order *and* his engineering time and money for the proposal."

● **Cecil C. Peck, president**
● Cecil C. Peck Co., Cleveland, Ohio

"In the past the automatic welding machine was usually considered an expendable item by industry management, one to be amortized in a 12 month period. Too frequently, a manufacturer would spend as much as $130,000 for a machine tool, but would make weldments to be machined on this equipment on a homemade welding rig.

"Today a number of automatic welding machines on the market are as flexible and universal in application as any standard machine tool you can name. Today's industrial management should give considerable thought to placing these machines in their shops."

● **J. P. Berkeley, president**
● Berkeley-Davis, Inc., Danville, Ill.

"Since the best modern automatic arc welders are precision machines, they can be expected to produce precision work. However, this only holds true if the parts which are presented to the welders are themselves precisely formed, so that holding, clamping and welding conditions are predictable. The parts also must be clean and the best possible joint design should be used.

"Serious thought must be given to cleaning and work handling devices. The metal forming operations ahead of the welder must be studied so that the workpieces are consistent in size and shape. The part design must be such that the weld can be made with maximum ease, since under any circumstances automatic arc welding is not a matter of simplicity.

"Finally, management should know that good results can be expected only if good operating personnel, supervisors and maintenance people are used."

● **E. W. Hollis, vice president**
● Lewis, Welding & Engineering Corp., Cleveland, O.

"Automatic welding machinery should be viewed from the standpoint of ultimate cost reduction, whether it be through labor saving, better use of materials or control over process and quality standards.

"As an integral part of the production line, automatic welding machinery should satisfy these three questions: One, is this the best and most economical welding process? Two, is all of the machinery of such a quality that it can function continuously in the production line with a minimum of servicing and maintenance? Three, is the machinery sufficiently dependable and reproducible to that it will function within normal rejection and rework allowances?

"Reviewing these questions may show that equipment to be purchased is inadequate for the job and would result in higher cost per unit, aggravated by down time or high rejection rates. This may lead to the conclusion prior to purchase, that a greater capital investment is involved that originally contemplated. Thus, whether to proceed, definitely becomes a matter of exclusive decision."

● **Byron Russell, president,**
● Airline Welding and Engineering, Gardena, Cal.

"Too often, engineers or shop personnel recommend automatic welding equipment that is too versatile or too precise for the job to be done. Such equipment is costly. In fact, management sometimes fails to buy the equipment because of this high price.

"Conversely, management is too frequently unaware of the development of new, efficient automatic equipment and how its capabilities can be translated into added profits. Management must keep up with the constant development of relatively inexpensive automatic equipment. Management should periodically pro rate the cost of such equipment over each unit to be produced and compare that cost with that of hand fabricated units. Automatic machinery is more than justified in nearly every case."

● **Charles N. Aronson, president,**
● Aronson Machine Co., Arcade, N. Y.

"Management should know that science will probably never come up with a substitute for a conscientious man. Advancement and improvement in products and profits still rest mainly in the calibre of the worker using the equipment—whether it be manual or automatic."

"Next in importance is that user-proved standard machines cost less and last longer than a specially designed machine. Whenever possible, the automatic installation should include as many of these standard machines as are available for the process."

"Finally, management should guard against a tendency to save a little on capital investment because it must be depreciated over a span of years, while the upkeep and repair of a cheaper machine is immediately chargeable to current expenses. This results in only a small tax savings and a great waste of profits through down-time and repair expenses."

● **Willard Gunzelman, general manager**
● World Electric Co., Cleveland, Ohio

"Management would benefit greatly by learning more about the available welding processes and when and where to use them. This does not mean they should and understand every minute detail about the process and apparatus. But, it does mean they should know about costs, deposition rates and whether or not AC or DC power is best suited for the application in question.

"Knowing more about the available processes and their uses would help management simplify the selection of proper equipment. It would prevent their choosing a process because it fits the budget, even though it is not the correct process for the application. When this happens, a unit is installed that *almost works*. Properly selected processes, applied with well designed equipment—standard or special, manual or automatic—will produce best results."

more comments on page 67

New Automatic Process Speeds Vertical Welding Of Heavy Plate

IN BRIEF: New automatic machine permits continuous, one-pass welding of plate or forgings from 1½- to more than 10-inches thick which can be welded in the vertical position.

THE POSSIBILITIES for welding heavy sections has been broadened by a new automatic welding machine introduced by Arcos Corporation, Philadelphia. The *Vertomatic* machine is used on plate and forgings from 1½- to more than 10-inches thick which can be welded in the vertical position. The machine permits continuous, one-pass welding of these heavy sections and eliminates the need for elaborate joint preparation and slag removal.

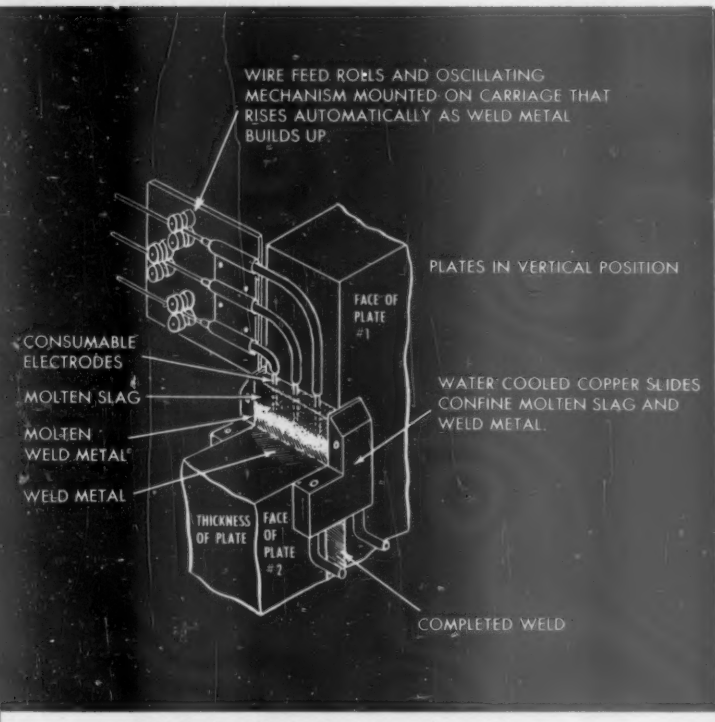
The *Vertomatic* equipment is based on the electroslag welding principle. Electroslag welding is an arcless process in which an electric current flows through a pool of molten slag. The resistance of the slag to the current creates a high heat. This heat melts both the filler metal and the parent metal, making a weld.

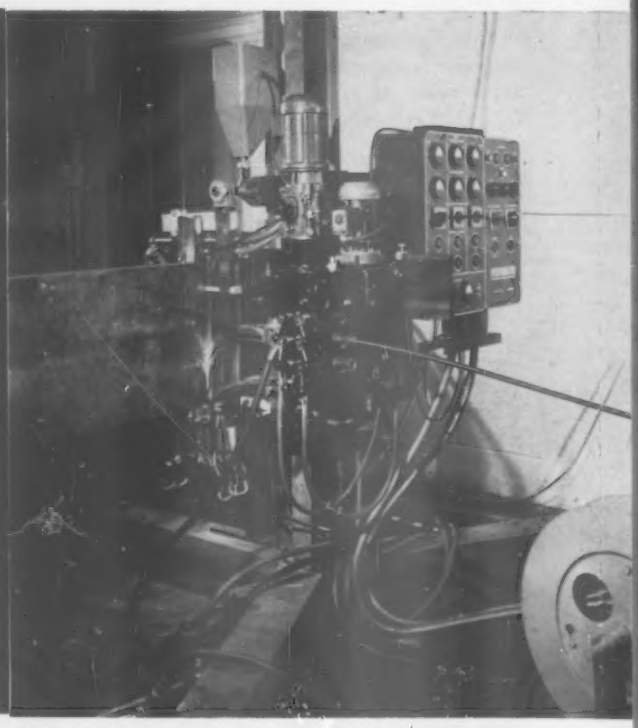
A surprisingly simple machine for the amount of work it can do, the *Vertomatic* equipment offers significant savings in time and material. Smaller joint gaps and less filler metal are required. Because electroslag welding is a single-pass operation and because the slag remains molten throughout, there are no time-consuming interruptions to remove slag.

Types of joints that can be welded include butt welds, T-joints, corner welds with inside fillet and reinforcing surface welds. The equipment has been used to make both longitudinal and girth seam butt welds in heavy wall vessels.

Until now the electroslag process has been used mainly on ordinary mild steel. However, the Russians say they have used it successfully on stainless and low alloy steels. Is seems reasonable to believe the process could be used to weld quenched and tempered steels. There is a possibility, however, of some loss of notch

continued on page 69


WIRE FEED ROLLS AND OSCILLATING MECHANISM MOUNTED ON CARRIAGE THAT RISES AUTOMATICALLY AS WELD METAL BUILDS UP
PLATES IN VERTICAL POSITION
FACE OF PLATE #1
CONSUMABLE ELECTRODES
MOLTEN SLAG
MOLTEN WELD METAL
WELD METAL
WATER COOLED COPPER SLIDES CONFINE MOLTEN SLAG AND WELD METAL
THICKNESS OF PLATE
FACE OF PLATE #2
COMPLETED WELD



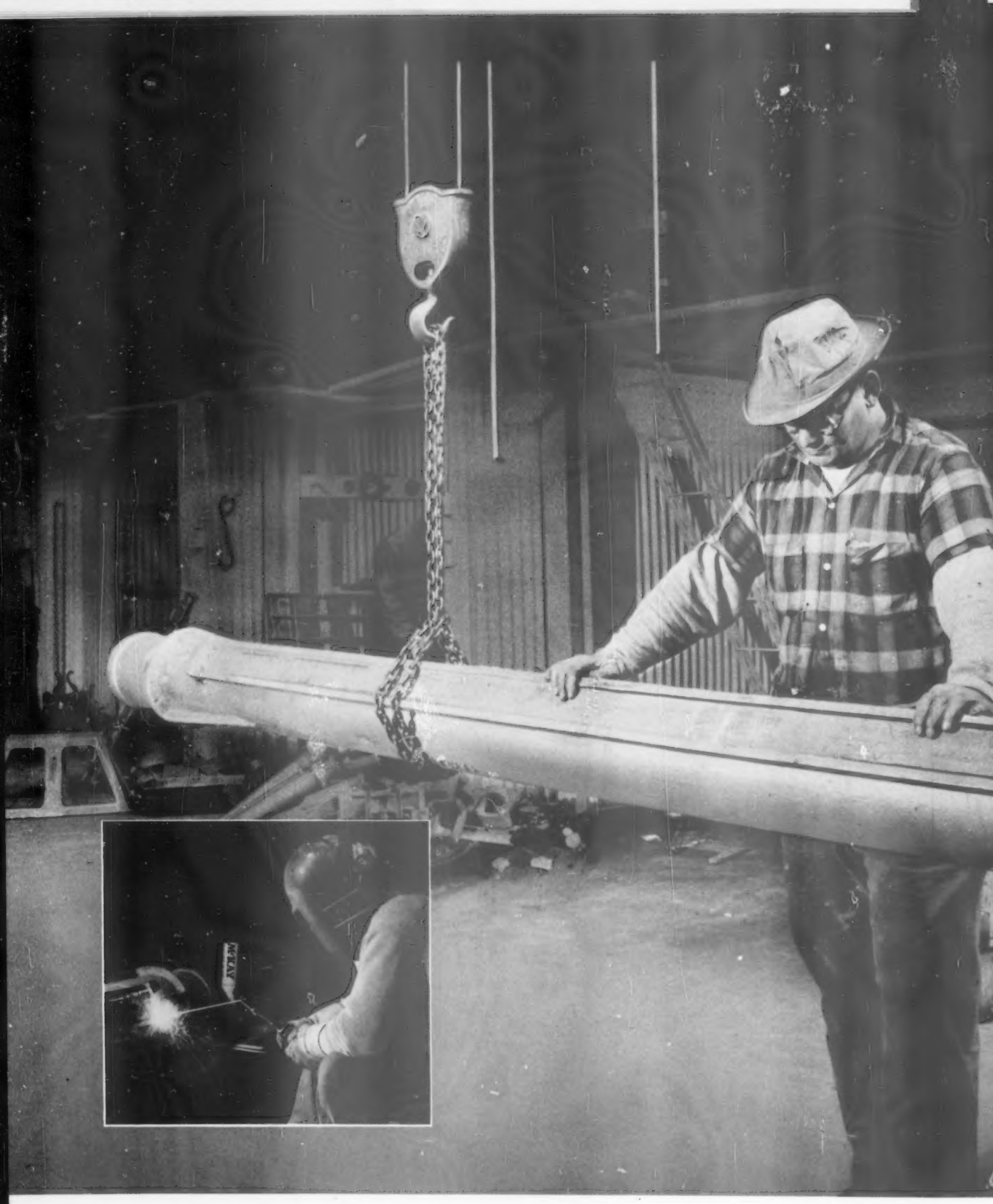
ESSENTIAL ELEMENTS of Vertomatic equipment used in Electroslag welding are shown in sketch (left). Photo (right) shows equipment with plate in position for welding.

Got a Welding Problem? Read how...

McKay Tube-Alloy 218-0 Wire cut weldment costs by $36,000 per year for Page Engineering Company.

McKay 11018 Electrodes meet the need for high tensile and yield strengths at Material Service Corporation.

McKay Stainless Steel Electrodes match the special formulations of custom steel castings for Fahralloy Company.



ABOUT FAHRALLOY COMPANY

The Fahralloy Company of Harvey, Illinois, is a custom foundry for quality high-alloy steel castings with facilities for a wide variety of process machinery and equipment. The company produces more than a million pounds of high-alloy steel castings per year for industries throughout the United States and Mexico.

APPLICATION DATA

Because of the custom nature of their work, all welding at the Fahralloy Company is done manually, using McKay stainless steel lime coated electrodes.

McKAY

STAINLESS STEEL ELECTRODES

...match the analysis in custom castings

"McKay stainless steel electrodes best meet the requirements of the custom-tailored work we do," says Mr. Teunis N. Paarlberg, vice-president and treasurer of Fahralloy Company, Harvey, Ill., makers of high-alloy custom steel castings.

Fahralloy stainless steel castings are custom-made for such diversified purposes as heat-treating furnaces, cement kilns, paper mills, ore-mixing machinery, food processing equipment and enameling bake ovens. This equipment is not only custom-designed, but it also requires precision controlled steel to meet normal service requirements.

"The McKay Company is the prime source of welding electrodes for Fahralloy because of the wide range of analyses available, and because McKay electrodes consistently produce individual weld deposits of high quality and uniformity," according to Mr. Paarlberg.

McKay stainless steel electrodes make smooth, machinable welds. They are manufactured under rigid control procedures to assure satisfactory performance in critical applications involving extreme temperature changes, high stresses or corrosive conditions. McKay electrodes are first choice with manufacturers of quality products and equipment.

It will pay you to become better acquainted with McKay products and services. See your McKay representative.

"McKay electrodes lay a smoother weld than any other kind. They are easier to handle because there is less 'build-up.' During the welding, less material shoots off as spatter, and McKay welds don't crack," says Mr. Bruno Szkaradek, Welder, Fahralloy Company.

See back page for helpful McKay literature

THE McKAY COMPANY

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ABOUT MATERIAL SERVICE CORPORATION

The Material Service Corporation, Chicago, is one of the nation's leading suppliers and processors of bulk materials for the construction industry, and of agricultural limestone. The company has extensive repair and maintenance facilities in Lockport, Illinois and in addition does considerable on-the-spot repair work.

APPLICATION DATA

The dip-stick fabricated by Material Service Corporation utilized 700 pounds of McKay 11018 Electrodes for joining 1½" plates of T-1 steel into sections 3" thick, to provide the high strengths needed in this application.

McKAY 11018 ELECTRODES

FOR WELDING T-1 STEEL

...*help make a stronger dipper*

"McKay 11018 electrodes and T-1 steel were combined to produce a shovel dipper stick in our shop at substantial savings," said Mr. Ernest Escobar, foreman of the welding division of Material Service Corporation. "This dip stick should outlast the shovel."

Material Service operates plants and quarries throughout the nation, producing sand, gravel, limestone rock and agricultural lime. The Lockport shops are responsible for maintenance and repair of all barges, locomotives, earth-moving machines, cranes, dredging equipment and freight cars.

The McKay Company's full range of electrodes and welding wires meet the widely diversified requirements of the Material Service Corporation. And of equal importance, their welders like to work with McKay products.

McKay 11018 electrodes are but one of a family of high quality iron powder, low hydrogen electrodes used by industry.

Whatever your electrode needs may be for mild or stainless steel fabrications or hard-surfacing applications, it pays to investigate McKay.

"In every application for which we use McKay, we get 100 percent good results," says Ernest Escobar, Welding Foreman, Material Service Corporation.

See back page for helpful McKay literature

THE McKAY COMPANY

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McKAY

TUBE-ALLOY 218-0 WIRE

...takes a $36,000 yearly bite out of drag-line bucket costs

"McKay Tube-Alloy 218-0 semi-automatic welding wire enabled us to greatly reduce our costs in producing drag-line buckets," says superintendent Mr. G. E. Steil, Page Engineering Co., McCook, Illinois, "yet we were still able to maintain the same high strength requirements previously obtained using stainless steel manual electrodes."

The teeth and lips of Page buckets take a tremendous beating in all sorts of terrain, including huge layers of overburden in coal strip mining and large fragments of blasted rock in quarries. To meet these extreme service conditions, Page welds a manganese steel lip to the low alloy hi-strength steel bucket.

"We selected McKay Tube-Alloy 218-0 wire because this was the only type of welding wire with which we could get a weld that retained the same physical strengths formerly obtained with stainless electrodes."

Many manufacturers are converting to automatic and semi-automatic welding to obtain faster, more uniform depositions and to reduce down-time. If you are considering such a change-over, McKay Hard Surfacing Field Engineers will assist in developing the most efficient and economical procedures for the application of McKay Tube-Alloy Welding Wires.

"We have not been aware of a single instance of the rupture of a joint welded with McKay Tube-Alloy 218-0 Wire," said Mr. G. E. Steil, Superintendent, Page Engineering Company.

See back page for helpful McKay literature

THE McKAY COMPANY

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·ABOUT PAGE ENGINEERING COMPANY·

Mr. John W. Page founded the Page Engineering Company in 1904 and he is still actively engaged with the organization. While dredging for the Hennepin Canal in Illinois, he first devised the drag-line principle for earth-moving. The company's buckets are busy in strip-mine machines in sub-arctic Canada, and in moving hot slag in steel mills, often at 800 degrees Fahrenheit.

APPLICATION DATA

Page bucket weldments are now made with McKay Tube-Alloy 218-0 wire on a semi-automatic welder with open arc. Deposition of weldment is at the rate of 12-15 pounds per hour.

"HELPS"

FROM THE McKAY COMPANY

Hard Surfacing Catalog

A 20-page catalog containing detailed alloy recommendations and welding procedures for the repair and reclamation of over 500 specific parts of various types of equipment. A useful guide to welders, welding engineers, field service and purchasing personnel.

For your copy circle No. 1 on Literature Request Card.

Hard Surfacing Manual (Earth Moving Equipment)

This manual provides detailed information and procedures for the deposition of alloys for the proper build-up and/or hard surfacing of over 30 illustrated parts used for heavy earth moving equipment.

For your copy circle No. 2 on Literature Request Card.

The Welding of Stainless Steels

A 48-page pocket size booklet which provides a quick reference to data on chemical analysis, mechanical properties, corrosion resistance and types of electrodes available for welding stainless steels.

For your copy circle No. 3 on Literature Request Card.

The Welding of Mild Steels

Pocket size 44-page booklet which catalogs specifications, operating characteristics, properties, uses and other data about McKay Mild Steel, Low Alloy and Special Purpose Electrodes.

For your copy circle No. 4 on Literature Request Card.

McKay Comparison Chart

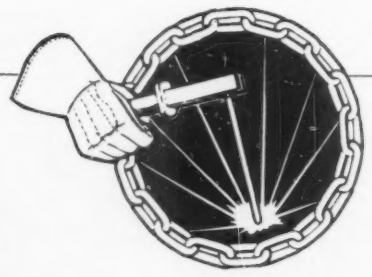
A handy and useful guide in matching brand name electrodes with AWS class or A.I.S.I. grade. Listed are all electrode classifications of The McKay Company with all major manufacturers' electrodes which fall into each individual class.

For your copy circle No. 5 on Literature Request Card.

McKay Selector Chart

A complete guide to the selection and use of McKay welding products including all classes of mild steel, stainless steel, special purpose, hard surfacing electrodes and automatic and semi-automatic wires.

For your copy circle No. 6 on Literature Request Card.



THE McKAY COMPANY

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Litho in U.S.A.

TWO 180-ft. shell-welding lines give Reynolds maximum flexibility and efficiency. Gantry welders drive to a girth seam, weld it automatically, then move on to another already prepared.

New Gantry Welder Speeds Girth Welding Of Missile Shells

IN BRIEF: Reynold's girth welder used to be tied up for hours waiting for shells to be assembled. There's no waiting now with their new gantry welders and 180-ft. long turning roll lines.

THEY MAKE precision girth welds on U.S. Army Redstone shells with two new time-and money-saving gantry welders. The welders were designed by the staff of the Reynolds Metals Company's missile plant (at Sheffield, Ala.). With these units they join by consumable electrode gas shielded welding shells about 5-ft. across, to lengths up to 180-ft. The shells form the skin of missiles that will carry this country's first spacemen.

The gantry can move 180 feet along its track or even further if the tracks were extended. It can be made to take larger diameter shells by adding extensions to the two upright columns.

The welding equipment used on the gantry is standard. The head consists of a torch, guide wheels, wire feed motor and wire straighteners, all mounted on a common base. The head moves vertically and horizontally.

Friction driving wheels along the floor track rotate the shells. The operator, at his console on the gantry, controls the rotation, as well as all welding operations.

The girth welder used to be tied up for hours while they aligned the shells and positioned the heavy back-up bars.

Now they can work 10 shell assemblies on each gantry line at the same time. They disengage an 8-ft. section of the shell driving wheels. Then they can set up or tear down work without disturbing welding. The welder rolls into position along the track only when a shell is ready for welding. That keeps it working at peak operating efficiency.

Before welding, each shell end is fitted with a stainless steel ring. The ring confines the shell when the back-up bars are expanded and provides a tracking groove for the torch guide wheels.

When the girth joint between two shells is aligned, the operator drives to the seam and positions his torch. He can move his platform to within an inch of the shell for a close look, but he can also dodge shell-clamp rings if necessary.

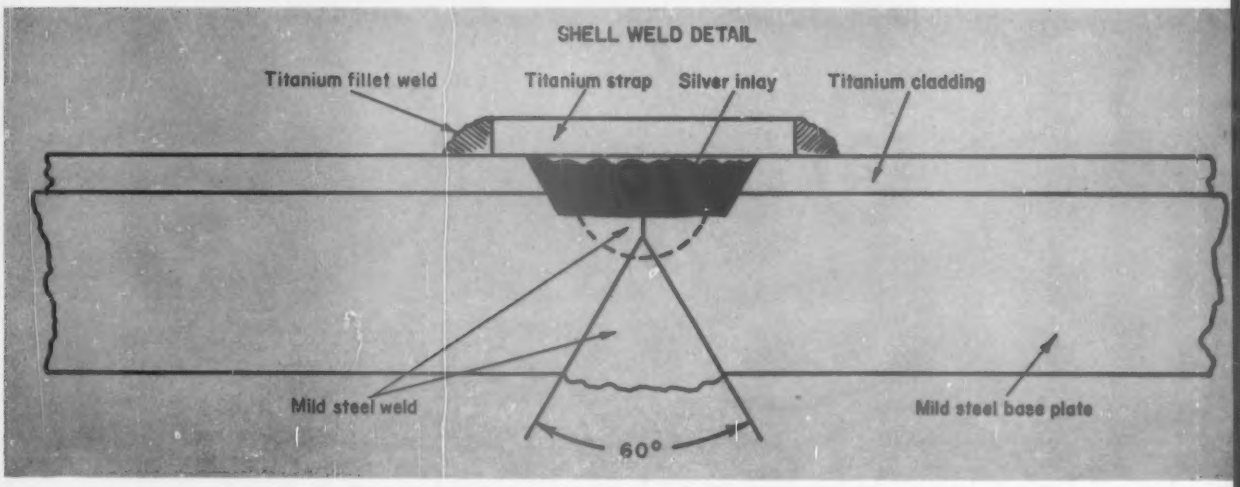
The machine is kept perfectly still during welding by four vertical air cylinders—one for each corner of the welder. The operator controls them by solenoid operated air valve controls.

All movements of the gantry welder are controlled from the console. The welding power supply, the torch coolant system, control relays, and speed controls are in two cabinets attached to the machine. Each cabinet is fan exhausted to dissipate heat. Air and power are supplied by an overhead track and trolley. Diffused floodlights on the underside of the crossbar keep the work well lit.

A ¾-h.p. motor with a speed indicator turns the shell driving wheels. Surface speeds up to 220 inches

continued on page 78

Breakthrough For Titanium-Clad



COMPOSITE PLATE SEAMS feature a silver inlay at the welded steel joint which is capped by a fillet welded titanium cover strap. This joint design eliminates direct joining of titanium and steel and brittle joints which would result.

IN BRIEF: New welding techniques open the door for the use of titanium-clad vessels throughout the chemical, petrochemical, paper and other processing industries.

THE WORLD'S FIRST commercial size titanium-clad pressure vessel is a complete success, according to S. C. Hamilton, vice-president-sales, Chicago Bridge & Iron Co., Chicago. The structure built last year for a West Coast petro-chemical firm has proved itself over many months of strenuous service.

DESIGN BACKGROUND

The CB&I announcement opens the door for the use of titanium-clad vessels throughout the chemical, petro-chemical, paper and other processing industries. Such vessels provide titanium's remarkable corrosion resistance at considerably less cost than that of solid titanium structures. (However, if the industry would normally use vessels lined with stainless, nickel, Inconel, Hastelloy or other corrosion-resisting material, titanium would be chosen only because it provides *superior* corrosion resistance in the application involved.)

TITANIUM-CLAD SHEETS are formed warm to reduce the normally high yield strength of the titanium cladding sheet and minimize a springback problem.

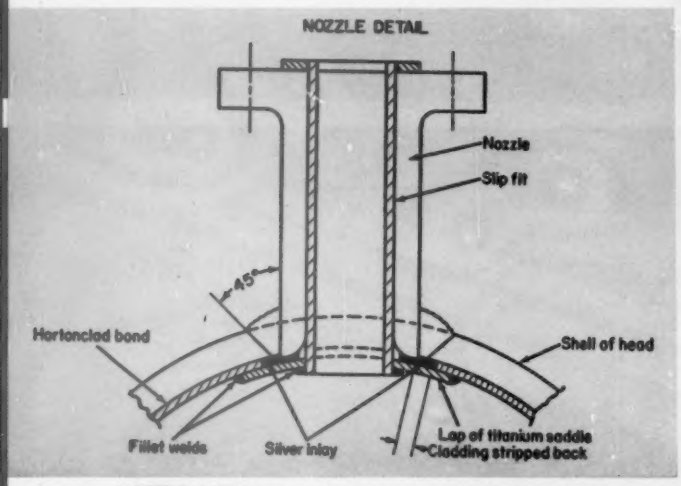
The titanium-clad vessel was installed at Shell Development Co., Emeryville, Calif., a Shell Oil Co. subsidiary. It was designed for a working pressure of 150 psi at 500°F and is approximately 4-feet in diameter and 12-feet high. It was fabricated from ½-inch ASTM A285 mild steel plates clad with 5/64- and 7/64-inch grade A-40 titanium. Hemispherical heads, top and bottom, each were welded from pressed segments. Fittings and flanges were titanium-lined.

Success with the vessel culminates a long period of research and development by CB&I metallurgists and engineers. These studies included the design and construction of a small 25-gallon titanium-clad pilot vessel. This vessel was used for more than a year to test the welding techniques eventually used on the full-size structure.

THREE PROBLEMS

Three big problems confronted CB&I. The first was to get strong, ductile bonds between the large mating surfaces of the titanium cladding sheet and the steel backing plate (clad sheets up to 5- by 7-feet

Vessels



NOZZLE DETAIL shows how silver inlay and titanium joints are made. Ingenuity was needed where nozzles join head plates.

FIRST COMMERCIAL-SIZE titanium-clad pressure vessel was built for a petrochemical firm.

were used). Another problem was forming the clad material. The third and final problem was developing a welded joint in which the titanium and steel are not directly joined by welds (steel-to-titanium fusion welds are extremely brittle). Here's how these problems were solved:

CLADDING IN A VACUUM

CB&I used its patented Hortonclad process to clad the steel plates. This high-strength vacuum-brazing process differs from conventional brazing. It uses neither fluxes nor special furnace atmospheres to obtain sound, high strength joints.

The brazing is done under a high interior vacuum. Atmospheric pressure on the outside exerts a tremendous, uniformly distributed force over the entire brazing area. This insure a continuous and uniform bond with only a very thin layer of brazing alloy. High bond strengths are obtained by alloying at interfaces.

The combination of high interior vacuum and high temperatures during the bonding cycle also causes breakdown of oxide films on the bonding surfaces, promoting the formation of strong, uniform bonds. Oxidizing gases evolved by these reactions and by outgassing of the metals being joined are immediately removed from the bonding interfaces by the high vacuum condition existing in these areas; reoxidation of bonding surfaces cannot occur.

Besides joining the two materials, the brazing metal prevents the steel from contaminating the titanium.

FORMING TITANIUM-CLAD STEEL

The segmental head pieces of the pressure vessel were formed warm. If they had been cold formed, they would have exhibited considerable springback. Warm forming minimizes this springback problem by reducing the normally high yield strength of the titanium cladding sheet. The less drastically formed sections were cold formed without difficulty.

The shell plate ends were pre-set on a press brake. Then plates were roll formed to a 4-foot diameter.

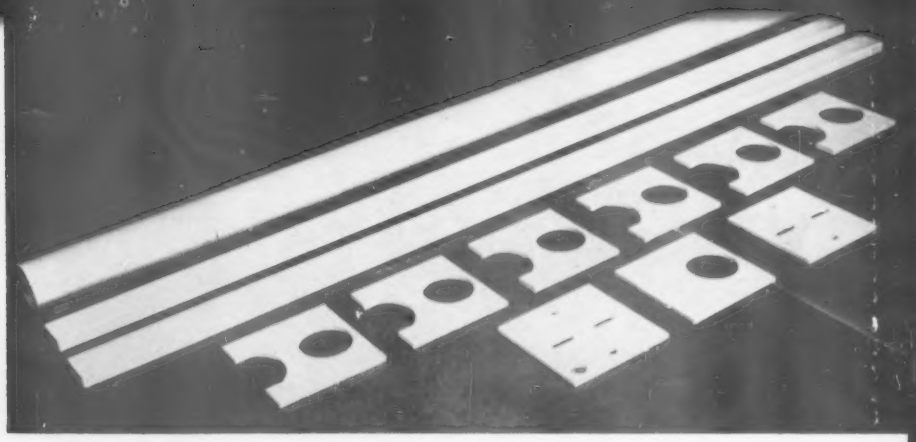
WELDING TECHNIQUES

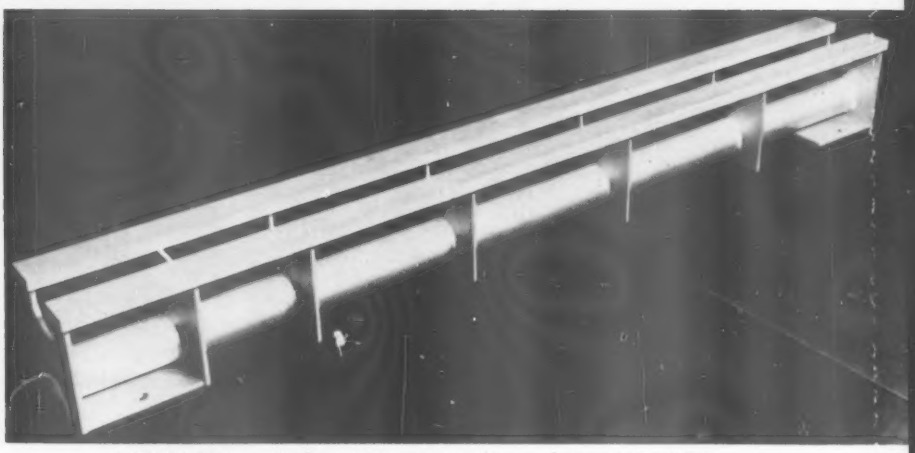
A special welding technique was used for closing the titanium-steel composite seams. This was done by depositing a silver inlay at the welded steel joint and then capping it with a welded titanium cover strap. This strap method combines weld strength for design considerations, freedom from notches or brittleness and a complete containment of the vessels contents by uncontaminated titanium-to-titanium welds.

First, the backing plate was welded manually using mild steel electrodes that matched the strength of the steel shell and head plates of the titanium-clad vessel. Then the silver overlay and titanium strap welds were made using the inert-gas tungsten-arc process.

All inlay welds were checked for soundness. The load-bearing steel welds were checked by X-ray prior to the application of both the silver inlay and the titanium straps. • •

this new wood-turning lathe is better looking, stronger and safer than its cast iron predecessor as . . .





LATHE BED is made from 12 components. Unique feature is the tubular spine which provides three times the torsional rigidity of former cast iron designs.

Redesign For Welding Cuts Lathe

IN BRIEF: Oliver Machinery Co. redesigned a 50-year old cast iron lathe for welded construction. The new lathe sells for 35 percent less than the cast iron one.

WHEN YOU CAN REDESIGN a 50-year old lathe so it is better looking, safer to operate, stronger (three times the torsional rigidity), and can be sold for 35 percent less than its predecessor, you have something. You not only have the opportunity to keep up with your competitors, but you also have the chance to make a king-size jump on them.

That's the story behind a new 5-foot wood-turning and metal-spinning lathe. It was redesigned from cast iron to welded steel construction by Oliver Machinery Co., Grand Rapids, Mich. About 1000 of these lathes are sold annually to schools and vocational training institutions. Current price level is close to $500.

Telling how Oliver turned the trick won a $10,000 First Award for Ernest Duesing, Oliver supervisor, in the 1959 Machine Design Competition sponsored by The James F. Lincoln Arc Welding Foundation, Cleveland, Ohio. Mr. Duesing is given credit for many of the novel welded steel design features in the lathe.

USE TUBING IN LATHE'S BED

The lathe bed has a piece of 2¾-inch OD seamless steel tubing as its central longitudinal member. Slipped over the tubing and welded to it are seven punched steel cross members, or gussets, of 5/16-inch plate. These are roughly square in shape and dished out at the top to provide bearing surfaces for two hardened steel ways. The ways are ¾- by 2-inch cold rolled steel bars. Bottom plates ¾-inch thick are welded to the underside at each end. This permits bolting the bed to pedestal supports.

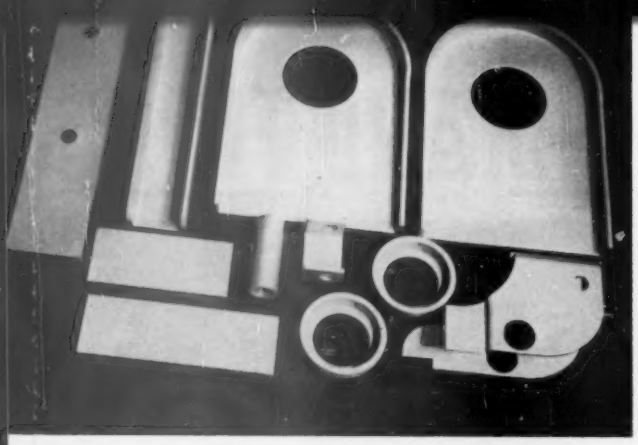
TWO PROBLEMS

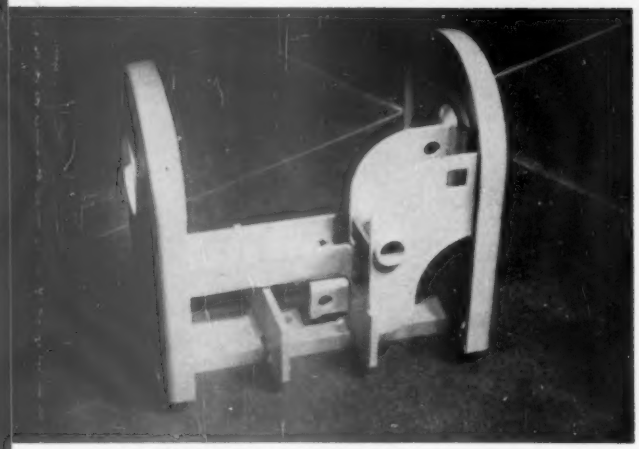
Two things had to be done in the bed assembly. The ways had to be perfectly straight and equally spaced to eliminate machining the four side faces. And, fixtures were needed which would allow easy and quick loading and removal of finished weldments.

TWO SOLUTIONS

Oliver developed two fixtures to do the job. In the

NOW YOU CAN GRIND AND FINISH





HEADSTOCK is fabricated from 11 steel pieces. Manufacturing cost is half that of earlier cast iron unit.

Cost 35%

first, the seven cross-pieces are accurately located around the tubing. Then they are clamped to keep all top surfaces in the same plane. Gussets are welded to the tubing on both sides, but only the two opposite and nearly vertical faces. Oliver omits fillet welds on the top and bottom of the tubing. This minimizes distortion. Enough strength was built into the fixture to straighten the tube while being welded. This meant that tubing could be purchased to commercial tolerances for straightness: 1/16-inch per five-foot length.

Two knobs at one end of the fixture clamp all seven gussets against vertical locating faces. Quick-acting toggle clamps straighten the tubing and align the plates horizontally. The fixture rotates on trunnions to permit all downhand welding.

When the gussets have been welded to the tubing core, the assembly is inverted and transferred to a second fixture. Here, the bottom plates and the two parallel top rails are welded in place. Since the cold rolled steel bars are seldom perfectly straight, the fixture was designed to straighten the rails. Pressure applied at seven points on each side clamps the rails securely against a hardened and ground spacing bar.

Welding the rails to the gussets causes a slight distortion-dip toward the welds which result in negligible uneveness—not over 0.010-inch on the top surface. This is easily corrected by surface grinding, which also dresses up the appearance of the exposed surface of the ways.

As a final touch, embossed 16-gage steel panels are welded across each side. These panels improve the bed's appearance and make it blend with the overall clean lines of the lathe. The panels also conceal all internal welds and eliminate any need for cleaning them.

COSTS CUT 48 PERCENT

The welded bed requires 102 pounds of steel shapes, costing $13.65. Labor amounts to $10.87, about half of which is charged to welding. This makes a total of $24.52.

In contrast, the cast iron lathe bed needed 156 pounds of iron, amounting to $26.52. Labor for planing, grinding and drilling was $20.73.

The result? A saving of 35 percent on material weight and 48 percent on total fabricating cost.

WELDED HEADSTOCK

The welded headstock is made of 11 standard steel shapes and simple stampings. The part is made in several stages. First, the ball bearing housings are welded into the end plates. These housings and plates are punched and formed from 3/16-inch sheet steel. Next, the bearing sleeve is welded into the dial bracket. Then, dial and pivot brackets are joined to the channel section. Finally, all parts, including the headstock tongue, are welded in a complete unit. Separating the operations this way simplifies the welding fixtures, insures better alignment, and makes better and easier-to-get-at welded joints.

Little machining is done on the headstock. The tongue is $\frac{5}{8}$- by $2\frac{1}{4}$-inch cold rolled steel and forms the base. It fits accurately between the two rails of the bed for positive location.. The two ball bearing housings are bored after welding for a good bearing fit and to spot the drive spindle.

Total cost of the welded headstock is $15.45. The original cast iron design cost $27.50.

OTHER WELDED PARTS

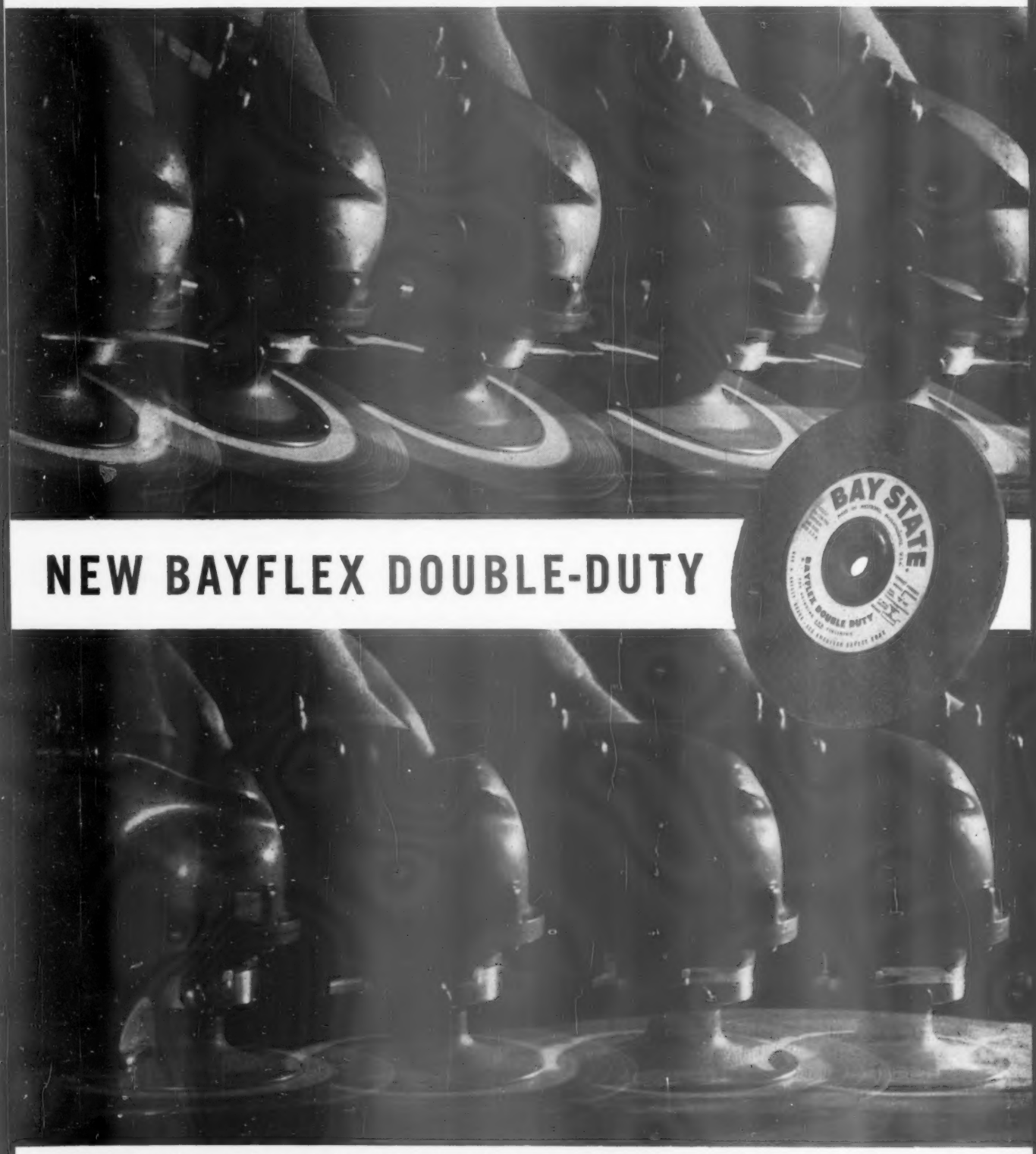
Tool rest and tool holders were a natural for welded steel fabrication.

Tool rests are made in 24 different models. These vary in length from 6- to 60-inches, come in 1-, $1\frac{1}{4}$- and $1\frac{1}{2}$-inch shank sizes and single pole, double pole or rectangular styles. Just four adjustable welding fixtures handle all 24 styles and sizes. Cost of the welded tool rest ($1.20) was about half that of the cast iron type ($2.25).

DESIGN VERSATILITY

With a slight change in tooling, the same unit is produced in the form of a 5-foot gap lathe. ••

NOW YOU CAN GRIND AND FINISH



NEW BAYFLEX DOUBLE-DUTY

Illustrations above show Bayflex Double-Duty in action, held at correct angle for weld bead grinding (top) and for finishing (bottom)

For More Information Circle No. 18 on Reader Service Card.

WITHOUT CHANGING WHEELS!

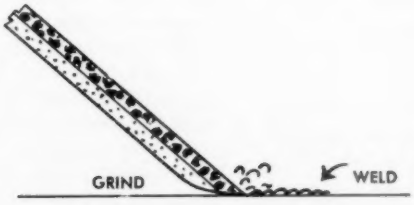
IS 2 WHEELS IN 1

There are two important angles to consider before you buy new weld-grinding or finishing wheels. Bay State's new Bayflex Double-Duty raised hub disc-wheel has them *both!*

The "DD's" unique, two-layer construction gives you two grinding angles: One is 30° - 45° which gives you fast stock removal for grinding weld beads . . . and the other is 10° - 20° which gives you a finish without gouging, a finish so smooth it's just short of a polished surface.

The upper layer for weld grinding comes in a single, standard specification. The lower finishing or blending layer comes in your choice of five different grits (24, 36, 54, 80 and 120) for every type of finishing job from heavy steels through light stainless sheets to aluminum and copper.

Your Bay State representative is ready now to demonstrate the Bayflex Double-Duty in your plant under normal working conditions. Get in touch with him and see what he can do to cut costs and speed up your weld grinding. You'll find he's more than a good salesman . . . because he's an experienced abrasive specialist, too. *Better grinding at lower cost . . . that is his business.*



Upper layer removes stock rapidly when disc is held at 30° - 45° angle.

Lower layer smooths and blends surface when held at 10° - 20° angle.

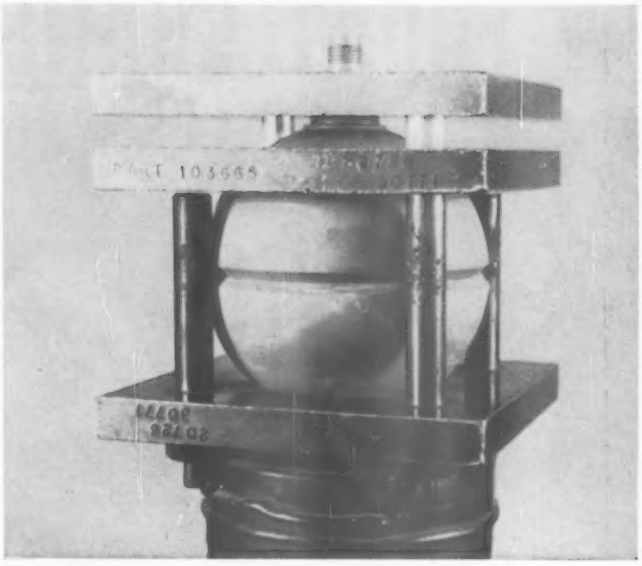
BAY STATE ABRASIVES

BAY STATE WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Mass.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh, Los Angeles.
Distributors: All principal cities

For More Information Circle No. 18 on Reader Service Card.

Material, welding, furnace brazing, heat treatment, and plating must be watched closely at Hughes. They can make or break this missile component.



ASSEMBLY: Hemispheres are clamped in this aligning fixture which holds them to within 0.005 inches for tack welding.

Alloy Steel Pressure Vessels Are

by **P. C. SIMMONS** and **WILLIAM SPONHEIMER**, *Hughes Aircraft Co., Tucson*

IN BRIEF: Hughes has kept rejects due to welding under 1% and rejects due to other processes low. They've done it with close processing controls and critical inspection and test.

The Hughes Aircraft Company makes a pressure vessel that is stressed almost 87% of its ultimate tensile strength. It's round—about as big as an indoor baseball—and it starts the Hydraulic power system of Hughes' air-to-air missile "Falcon".

The vessel is fabricated by automatically welding two hemispheres. But also, it is furnace copper brazed, heat treated, and cadmium plated. All of these operations take close watching to keep rejections low and, more important, to keep a defective vessel from wrecking a missile.

Close process controls and careful test and inspection procedures have accomplished both goals.

The hemispheres are machined from normalized AISI 4130 steel forgings to 1.950-1.955 inches outside radius and 0.165-0.175 inches wall thickness. Edges are beveled from the outside to a 45° angle, leaving a 0.030-inch land on the inside. Half of the hemispheres have recessed outlets. In each outlet a retainer diaphragm is copper brazed.

The wire used to weld the vessel is 1/16-inch copper-coated, low alloy steel with this nominal composition: carbon-0.35, manganese-1.00, chromium-1.10, vanadium-0.20, and silicon-0.50.

Just before welding, the edges to be joined are thoroughly cleaned to insure good fusion. Then the hemispheres are assembled.

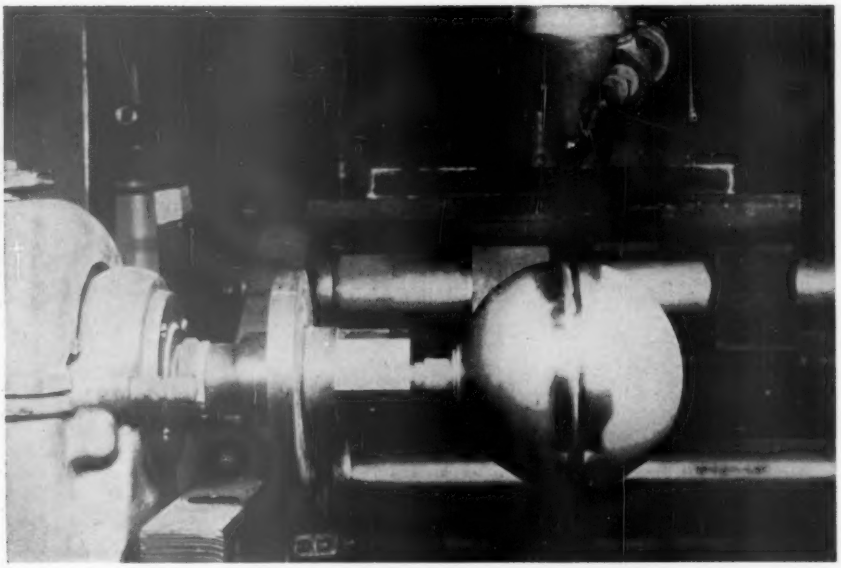
It's done in a fixture that aligns the halves to within 0.005 inches for inert arc tacking. The sphere is purged with inert gas and quickly attached to the welding lathe.

During welding the sphere turns one revolution in 105 seconds. First, the root is welded without filler metal but with complete fusion. Near the end of the root pass an automatic feathering device is turned on. This device reduces current gradually to smooth the weld and limit the chance of cracks, craters, or blow holes. Then the weld is wire brushed.

Two filler metal passes complete the joint. The first one is deposited on one side of the joint, the second on the opposite side. Filler wire feeds into the arc at 19 ipm. At the end of the first pass the welding head is shifted to make the second weld without stopping. Near the end of the final pass, the wire is stopped and the weld is feathered.

Commercial helium (at 35 c.f.h.) is used to shield the weld puddle. To prevent porosity due to moisture, a dry-ice cold trap is placed in the gas line just ahead of the welding head.

The welding machine is qualified and certified for vessel work by having it make test spheres. Fifteen of them are brazed, welded, heat treated, and pressure tested to destruction. A weld can fail, yet be ac-



WELDING: Inert gas purged sphere turns in lathe one revolution in 105 seconds. Wire feeds into tungsten inert arc at rate of 19 ipm for second and final passes.

WHY SO GOOD?

Though no bigger than a baseball, the Falcon's pressure vessel starts its hydraulic power system, a key function in the missile's operation. It's got to be good to hold the hydrostatic pressure Hughes gives it and not yield more than 0.2%. This pressure imposes a stress of near 155,000 psi on the wall and the weld of the vessel.

The welds must be free of defects, for at these high stress levels they act as notches from which cracks start, and spread explosively into a fracture.

Proofed At 155,000 psi

ceptable, if its calculated stress at failure is at least 95% of the ultimate strength of the base metal. If a weld isn't acceptable, the machine is reset until a good weld is made. Then five more vessels are made and tested to prove that good welds can be made, time after time.

Good vessels fracture across the weld on the burst test, and the crack usually starts at the neck-wall notch. Badly decarburized vessels fail by cracking outside the weld, sometimes near the neck. Vessels with weld defects fail by cracking parallel to the weld, usually at the weld-base metal interface.

The worst kind of a weld defect is a cold weld (lack of fusion), caused by too little arc heat. It's bad because it is continuous, usually long, and because it follows the direction of stress. You can tell a cold weld by the parallel cracks that occur on either side of the weld. Vessels with cold welds often fail below the proof pressure of 28,500 psig. Some fail as low as 14,000 psig.

Moisture in helium or in the atmosphere will cause porosity in the weld. And the porosity seems worse if the welding head isn't aligned during the filler metal passes; what's worse, poor fusion results.

Decarburization at the weld-base metal interface results in the lowest unit strength. All vessels seem to have it to a degree, but those welded with impure helium are worse.

Incomplete penetration is a serious but uncommon defect. It is caused by too little arc heat or badly oxidized surfaces. Good penetration will give a convex weld bead on the I.D. Incomplete penetration will leave an unfused seam there. Slight undercuts do not seem to weaken the vessel.

Decarburization from furnace brazing or heat treatment causes most vessel failures. Decarb can make an otherwise satisfactory vessel fail prematurely. The reason: decarb distorts the vessel during the pressure test, makes the weld bend more than it should. Thus, decarb can make borderline weld defects the beginning of a failure.

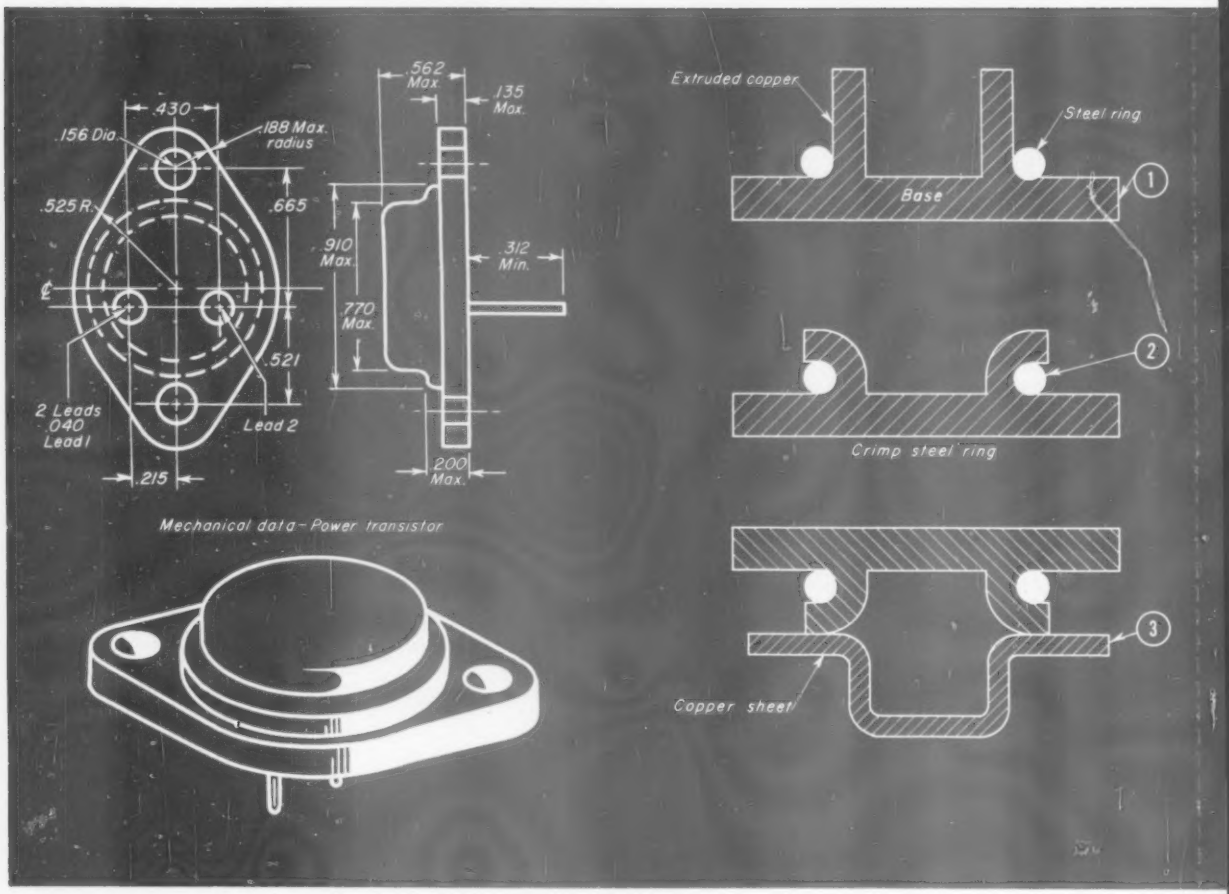
You can control decarb on the outside of vessels with carbon restoration during heat treatment, but there's no way to do it on the inside of vessels.

Heat treatment increases the notch sensitivity of base metal and weld metal and magnifies the effect of weld defects. Cadmium plating embrittles the hardened steel by hydrogen absorption. Removal of hydrogen after plating prevents weld failures.

The vessel and its components get this critical inspection:

1. Certified chemical analysis of forgings and welding wire.
2. Dimensions of hemisphere.
3. Inspect parts for cleanliness before welding.
4. Inspect root pass for complete fusion.
5. Machined weld discloses subsurface porosity. If found, vessels are repair welded.
6. Magnetic particle inspection of heat treated vessels

continued on page 79



DESIGN: Cold welding improves transistor operation three ways: superior thermal properties, improved reliability and longer, more efficient service life.

MATERIALS AND PROCESSING: Cross sectional drawings show step-by-step assembly and processing of transistors: (1) copper base is inserted in bottom welder die and steel ring is

Design For Cold-Welding Makes

IN BRIEF: An engineered cold-welding line with vacuum drying furnaces, dry-air welding atmosphere and clean parts makes possible top quality, high volume production of copper transistor components.

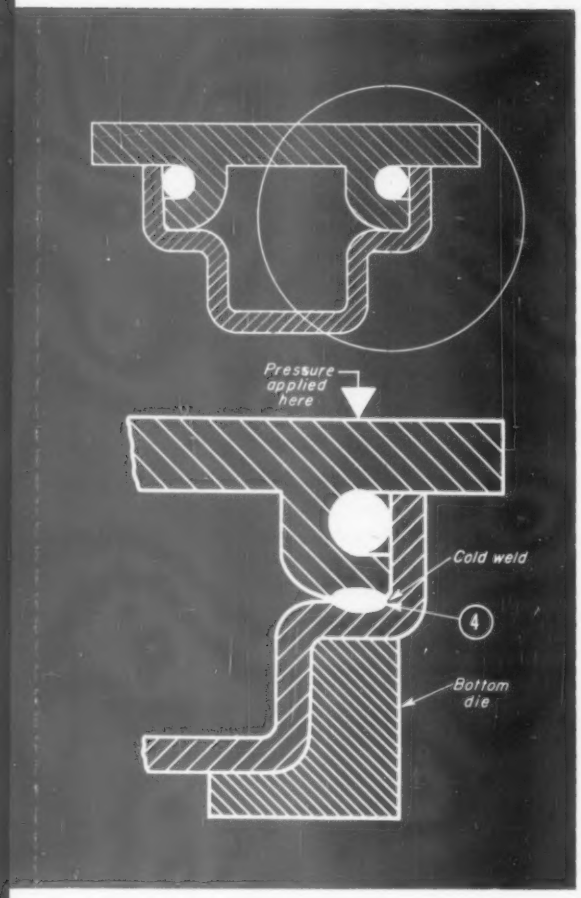
COLD-WELDING is nothing new to the Semiconductor Division of Tung-Sol Electric Inc., Newark, New Jersey. This company developed a new, fast way to join transistor components. And, the seal they get is hermetic.

According to Meade Hower, chief manufacturing engineer, the new "Cold-Weld" is not produced by electrical energy. He said that most welding uses electrical energy to fuse parts together. "Cold-Weld" uses no electrical energy. The parts are pressed together in a dry-air atmosphere. Tons of pressure in a die cause the metal parts to flow together and seal the components.

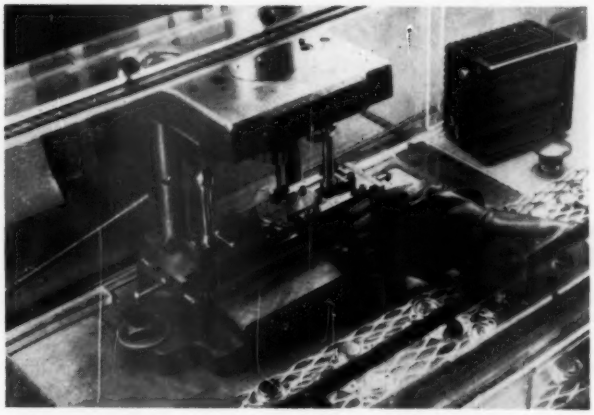
Hower said that cleanliness is vital. The smallest amount of grease inhibits the welding. To insure cleanliness each part is cleaned thoroughly. And after cleaning, and throughout production, bare hands do not touch the parts.

MATERIAL AND DESIGN

Tung-Sol engineers feel that if you design the parts correctly and if you use the right materials, cold-welding would be effective for many jobs. Their transistor has three main parts. The base is of high quality extruded copper. The case is of copper sheet, stamped



positioned; (2) press crimps copper base lip and locks ring in place; (3) copper sheet hat is positioned for welding to the base and (4) weld is made.



FABRICATION: Production line (top) has all transistor components centrally located for speedy welding which is done in dry atmosphere plastic-enclosed chambers (bottom.)

Vacuum-Tight Copper Joints

to a hat shape. The third part is a steel ring, a key part of the design. The ring is a support back up for case lip and base welded surface. (See design sketch.)

This transistor is for low-speed switching where high power handling capacity is required. The collector is connected directly to the case for conduction cooling. Tung-Sol found that this new copper-to-copper sealed transistor has better cooling, better moisture-proofing, longer life.

PRODUCTION

To keep parts free from contamination by oxidation, Tung-Sol makes all cold welds in a dry atmosphere. The photo shows a series of plastic enclosures. Each operator can pass parts through cut-outs, keeping them from outside exposure. They centrally locate all parts for assembly and welding. Attached to the plastic enclosures are small vacuum furnaces. Parts are dried in them after cleaning. The operator can reach into the plastic chamber to take parts from the furnace. She then assembles and welds the parts. Of course, all the work is done under the enclosure in the clean, dry air.

You just can't reach into the plastic enclosure with your bare hands. The portholes are sealed with long-armed rubber gloves. To work inside, you first have to put your hands into the gloves.

This close-controlled handling of parts assures a smooth trouble-free production line, and quality cold welds.

To further insure transistor quality, the cold-weld seal is given two rigid tests—the 100-psi bomb immersion test and the critically sensitive mass spectrometer leak test. • •

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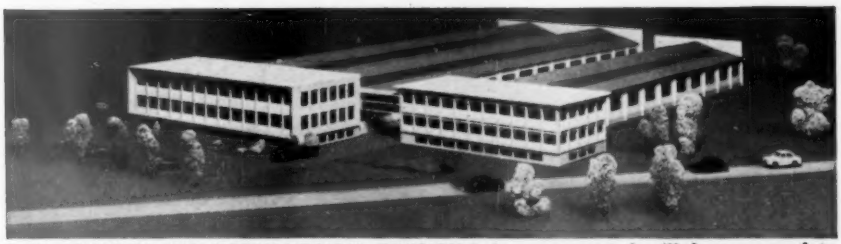

NEW FOUNDRY AND METALLURGICAL DIVISION being constructed will house complete facilities for metallurgical research and developments, as well as the actual production of core wires from virgin metal.

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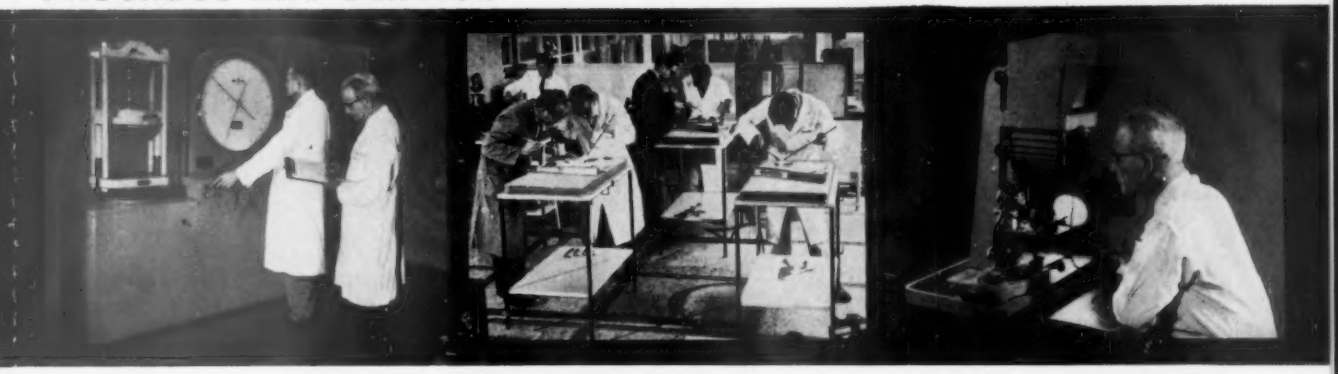

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REFERENCE DATA *catalogs, handbooks, manuals*

PIPE WELDING ACCESSORIES that contribute dollar-saving efficiency to welding operations are featured in literature from M. J. Crose Mfg. Co. Described and illustrated are cutting and beveling machines, line-up clamps and coupon cutters. **For More Information Circle No. 22 on Reader Service Card.**

POSITIONING EQUIPMENT of all sizes and types is the subject of a 14-page illustrated brochure published by Unique Equipment Company. Application shots show floor and bench type positioners, smooth-rotation turning rolls and fitup rolls, and welding head manipulators. Another Unique welding positioner shown is a floor-type turntable designed for overhung loads; outrig casters prevent tilting. **For More Information Circle No. 75 on Reader Service Card.**

IMPORTANT SERVICE BULLETIN called "Causes and Cures for Hot Running Welding Cables and Connections" has been issued by Tweco Products, Inc. Bulletin CC-59 is loaded with tips that can save money by preventing current-sapping, equipment-damaging leaks. Bulletin gives step-by-step procedures for checking hot holders and grounds, explains why heat costs money, gives tables of proper cable sizes to use, and discusses the merits of various connections. **For More Information Circle No. 76 on Reader Service Card.**

THE PERSONNEL, the plant and the products of the Miller Electric Mfg. Co., Inc. are the subject of an informative 48-page booklet "The Miller Electric Story." Issued as a thirtieth anniversary piece, the booklet gives a brief historical background of the company, makers of arc and spot welders, then discusses the functions of each department. **For More Information Circle No. 77 on Reader Service Card.**

A POSITIONER rated at 350,000 lb. load capacity with CG 12" above table and 6" off-center is the subject of a specification sheet prepared by the Aronson Machine Company. Sheet describes the Model G3500 Excalibur's 4-speed gearshift transmission, its 88" floor to horizontal rotation axis dimension which makes it easy to get at both large and small weldments, and the versatility of the unit. Dimensional drawing and speed ranges are also given. **For More Information Circle No. 78 on Reader Service Card.**

GAS WELDING RODS, a comprehensive 8-page bulletin, DH-1277-B, covering rods for welding ferrous metals has been released by Page Steel & Wire Division, American Chain & Cable Co., Inc. Information is given for each rod on uses, procedures, analysis, and physical properties. Information and data are also presented about the oxy-acetylene flame, torch tip sizes, pipe welding, weights of rods and welds, and cost estimating. **For More Information Circle No. 81 on Reader Service Card.**

CARBON DIOXIDE WELDING BOOKLET just published by Hobart Brothers Co., is a 38-page booklet on Migarc (Hobart's metal-inert-gas-shielded arc process) welding of mild steel and low alloy steels with carbon dioxide (CO-2) shielding gas. **For More Information Circle No. 82 on Reader Service Card.**

FACTS AT YOUR FINGERTIPS: *If you want copies of the catalogs featured on these pages, just circle the appropriate numbers on the bound-in Reader Service Card. We'll do the rest.*

Use a PLASTIC filter for Arc Welding?

NO! NO!

• Until now, the answer has been emphatically *no!* But for the first time anywhere, a plastic plate is available that will filter the harmful ultra-violet and infrared rays of arc welding—and filter them to the same degree as the rigid standards set for glass in Federal specifications. Years of research have resulted in CESCO's new PLASTI-WELD* filters, which give arc welders these unusual advantages:

- **LARGE WINDOW AREA**
  In addition to the standard size 2″ x 4¼″, PLASTI-WELD FILTERS may be used in CESCO 401-16 and 403-16 helmets. These give 77 square inches of viewing area, *curved* for panoramic vision.
- **LESS FREQUENT REPLACEMENT**
  The slightly higher price of PLASTI-WELD filters is greatly offset by their ability to outlast glass, *as much as 6 to 1.* Less breakage from dropping, impact or thermal shock.

- **HIGHER VISIBILITY**
  Comments from hundreds of welders who field-tested PLASTI-WELD filters state that they give "unusual clarity—sharper definition of outline." Result: better output, higher quality work.
- **LIGHT WEIGHT**
  The 2″ x 4¼″ PLASTI-WELD filter, encased in its own rubber gasket, weighs less than one ounce, compared with two-and-a-half ounces for the average glass plate and cover glass. Regular lens gasket is not required. 7″ x 11″ PLASTI-WELD filter weighs only four-and-a-half ounces.

FOR MORE INFORMATION about CESCO PLASTI-WELD filters, contact your nearby CESCO distributor or write our Chicago office

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33 MODELS THEY ALL HAVE WIDE BLADES

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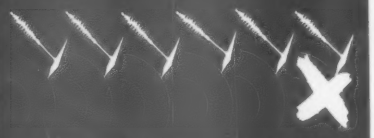

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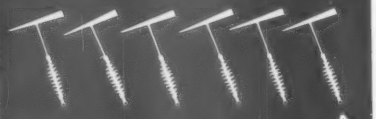

It's like getting a free tool every time you buy five, because the new wide blades wear longer.

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For More Information Circle No. 14 on Reader Service Card.

A NEW RE-GALVANIZING COMPOUND is introduced in literature from Galv-Weld Products. Four-page brochure explains how a patented, low-melting (450°F) alloy can be used to re-galvanize structures and sheets. Complete photo story shows how to use the new product which is available in small (8 ounce) or large (1½ lbs.) bars.

Circle No. 29 on Reader Service Card.

HOW SCALE AND OXIDE are removed from stainless steel and aluminum is the subject of handy catalog sheets available from Chemclean Products Corp. Described in detail is the company's Ox-Off 536 chemical compound; operating instructions are given. Lightweight, portable electric applicator is also featured.

Circle No. 79 on Reader Service Card.

THE TISCO LINE of bulldozer sprocket rims, tractor pads, end bits and blades is featured in a brochure now available from Taylor-Wharton Co., Division of Harsco Corp. Operating advantages of Tisco renewable, work-hardening manganese steel parts are outlined; stock part specifications for all first-line crawlers are tabulated. Procedures for rapid installation of sprocket rims are described.

Circle No. 80 on Reader Service Card.

STAINLESS STEEL ELECTRODES are the subject 4-page Bulletin R-49 issued by Harnischfeger Corporation. Full specifications are given for the extended line of AWS-ASTM electrodes, each of which carries the AISI type number in the trade designation to insure selection of the correct electrode. In addition, the applications of each electrode is discussed.

Circle No. 33 on Reader Service Card.

WINTER LINERS for safety hats and caps are outlined in Bulletin No. 67 just offered by the Fibre-Metal Products Company. The bulletin lists headband sizes for their complete line of liner models.

Circle No. 83 on Reader Service Card.

Facts At Your Fingertips

If you want details about products described or advertised in this issue, circle the number on the card that corresponds with the number under each advertisement or product description.

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13	29	45	61	77	93	109	125	141	157	173	189	205	221	237	253	269	285	301	317	333
14	30	46	62	78	94	110	126	142	158	174	190	206	222	238	254	270	286	302	318	334
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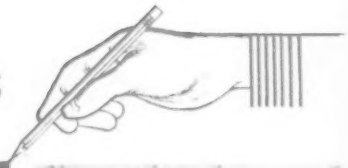

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ADVERTISEMENTS — a showcase of the latest in components, equipment and techniques.

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PRODUCT APPLICATIONS—brief reports on successful applications of recently developed products and materials.

NEW LITERATURE—offerings of new catalogs, data books, price lists, and other valuable reference material.

Please send free tear sheet of pages_____.

WELDING FITTINGS and forged steel flanges for nominal pipe sizes including 26″ are the subject of Bulletin FDC-273 issued by Babcock & Wilcox Co. Tables show diameters and wall thicknesses for carbon, alloy, and stainless steel fittings, and dimensions and approximate weights of elbows, tees, reducers, and others. 14 drawings show key dimensions listed in tables.

Circle No. 102 on Reader Service Card.

SNAGGING WHEEL SELECTION for swing frame, floor stand, and portable grinding are described and illustrated in a new catalog (PG-356) issued by Cincinnati Milling Products Division. The catalog also includes grinding costs, safety practices and a table of starting grades for rough grinding operations.

Circle No. 104 on Reader Service Card.

WIRE BRUSHES for industry are pictured and described in Catalog No. 60 available from Anderson Corp. The catalog offers a selection guide to the use of Anderson's complete line of brushes. Specifications and details are given for each type.

Circle No. 105 on Reader Service Card.

POCKET this convenient "Pocket Guide To Steel Analysis", a convenient 20-page booklet that lists the compositions of 40 stainless steels, 184 alloy steels and 105 carbon steels most often used in industry. The booklet, prepared by the Stainless and Strip Div., Jones & Laughlin Corporation, also contains important federal specifications with corresponding SAE, AISI and AMS numbers.

Circle No. 106 on Reader Service Card.

A PRECISION POSITIONER built by Boesch Mfg. Co., Inc. is the subject of a 4-page illustrated brochure prepared by the company. The literature describes Model PM-1051 which features smooth operation, positive stops, ease of control, remote control switch, reversible table rotation, dynamic braking, and others. Literature explains the control panel, the turntable position, rotation, and speed, and lists the 2000 lb. capacity machine's dimensions.

Circle No. 107 on Reader Service Card.

WALL CHART simplifying procedures for making permanent electrical connections to any copper conductor or steel structure is available from Burndy Corporation. It shows how to use the ThermOweld process. Instructions explain how to select a mold, prepare the cable and make a solid weld.

Circle No. 108 on Reader Service Card.

CARBON BRUSHES for d. c. Welders are pictured and illustrated in a new catalog, No. 15B available from The Ohio Carbon Co. The catalog contains dimensions and descriptions of original and replacement brushes for all common welders. Welders are listed by name, amps, model and type. Brush numbers are listed in numerical order by size and type.

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Speed-Up WELDING
WITH SUPERIOR'S BENCH MODEL POSITIONER-TURNTABLE

Weighs 20 Lbs.

LOW PRICE • HIGH QUALITY

Holds work in any position from vertical to horizontal and will carry 100-pound load.

Smooth, stepless speed change, both forward and reverse, from zero to 6 rpm —greater speed if desired. Ideal for aircraft work.

Reduces rejects—increases output up to 25%. Gear driven motor, v-belt transmission with tension control, built-in ground for more uniform welds.

Good Distributor territories still open • Write for details

For additional information, write or wire to:

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Eliminates Spatter Grinding After Welding

YORK'S *SPAT-R-PRUF* COMPOUND 106

THREE *EASY* STEPS

1. Coat Surface
2. Weld
3. Wipe Off

A perfect paint base. No stirring or dilution necessary. No grinding after welding—spatter can be wiped away with a dry cloth.

IMPORTANT FEATURES

- Non Toxic
- Non Inflammable
- Pleasing Odor
- Harmless to Skin
- Helps Prevent Rust
- No Weld Porosity

Available in 1 gallon cans and 5 gallon cans and 55 gallon drums.

3-IN-1 YORK'S '77' SPECIAL FLUX

- For General Brazing
- For Cast Iron Welding
- For Cast Iron Brazing

A guaranteed bond even under toughest conditions.
Available: 1 lb. Cans

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For More Information Circle No. 23 on Reader Service Card.

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MODEL 40 SPECTACLES

MODEL 492 GOGGLES

There is a Dockson goggle or spectacle to meet any requirement. Low cost, high quality equipment, "Built for better protection." Scientifically designed for safety with maximum comfort. Many outstanding features and careful construction usually found only in higher priced equipment. You'll like 'em!

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3839 Wabash — Dockson CORPORATION — Detroit 8, Mich.

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CUSTOMER SERVICE STATIONS
FOR LIQUID OXYGEN, NITROGEN AND ARGON

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For details, write to:

Cryogenic Division
RONAN & KUNZL, INC.
MARSHALL, MICHIGAN

For More Information Circle No. 55 on Reader Service Card.

REFERENCE CHART, "Basic Guide to Ferrous Metallurgy", has been issued by Tempil Corporation in a 4-color, 8½" by 11" format. Just right for the engineer's metallurgist's, or skilled worker's data book, chart gives the principal characteristics of steel's ranging to 0.9 carbon. It also shows important working zones, including preheating for welding, stress relieving, normalizing, annealing, and forging; defines and explains 24 common metallurgical terms. Tempil's temperature indicating materials are also described.

Circle No. 84 on Reader Service Card.

ABRASIVE CUTTING COOLANT for use on wet abrasive cutting machines and for most grinding operations is featured in a one-page, two color brochure available from Allison-Campbell Division, American Chain and Cable Company, Inc. The illustrated sheet presents complete use and price data for the coolant.

Circle No. 85 on Reader Service Card.

INDUSTRIAL GASES are thoroughly covered in a new 32-page booklet just issued by Air Reduction. Illustrated with both four-color and black and white photographs and drawings, the booklet offers a comprehensive survey of how each gas is made, delivered and used. One section of the booklet is devoted to gaseous or liquid delivery and storage systems.

Circle No. 86 on Reader Service Card.

SPLITTING I-BEAMS is the subject of a new 1-page bulletin issued by American Pullmax Co., Inc. The Pullmax U-10 is illustrated and described in the bulletin. Also described and illustrated are the many types of cuts the machine can perform.

Circle No. 87 on Reader Service Card.

CHARTS THAT TELL where and how to use aluminum for welding, brazing and soldering, have just been revised by All-State Welding Alloys Co. Physicals, recommended joining materials, and typical use are shown for 24 aluminum

alloys. Eight separate charts are condensed into one to cover data on melt and flow temperatures and plastic ranges of typical aluminum alloys. Data on how to choose the right solder and flux for joining aluminum to aluminum and to dissimilar metals, is included.

Circle No. 88 on Reader Service Card.

THE HELIARC LINE of manual welding equipment is fully covered in a new, 20-page catalog (F-8982E) now available from Linde Company. The catalog illustrates Linde's complete line of manual torches in one-half actual size

Circle No. 89 on Reader Service Card.

WELDING CHARACTERISTICS and data for four types of "Dual Shield" continuous fluxed cored electrodes are contained in a new bulletin (NH-103T) available from the National Cylinder Gas Division of Chemetron Corporation. Diagrams show correct operating positions for automatic and auto—manual welding guns. Welding procedures also are described.

Circle No. 90 on Reader Service Card.

HYDRAULIC SHEARS with pivoted-blade action are described in Catalog No. 2030-A just issued by the Steelweld Machinery Division of the Cleveland Crane & Engineering Co. The booklet illustrates and provides construction details and specifications on all shear sizes available.

Circle No. 91 on Reader Service Card.

COVER AND CURTAINS for numerous industrial, commercial and military uses are described in bulletin GS-400 available from A & A Mfg. Co., Inc. Neoprene base materials are used in the covers and curtains. Other materials are also described.

Circle No. 92 on Reader Service Card.

FLUX RECOVERY UNITS and allied equipment are featured in a two-page brochure available from J. D. Brophy, Inc. The illustrated brochure presents complete description, price data and specifications for both portable and stationary flux recovery models.

Circle No. 93 on Reader Service Card.

For More Information Circle No. 10 on Reader Service Card.

no matter what the two metals are . . .
now you can **SOLDER** them

PROBLEM:
Joining copper pipes in extremely hard water area. Lead solders made porous joints. Heat required for high temperature solders burned copper pipes.

SOLUTION:
All-State's #430, a silver-bearing solder which flows at 430F, made perfect, permanent joints, solved the problem.

ALL-STATE has a solder for joining any commercial metal or alloy to any other . . . in one or more temperature ranges. For typical examples, see tables below:

400°F-500°F

Al.	Copper	Brass	Steel	S.S.	Nickel
37	107	107	107	107	107
107	430	430	430	430	430
107	430	430	430	430	430
107	430	430	430	430	430
107	430	430	430	430	430
107	430	430	430	430	430

	700°F-800°F					
	Al.	Copper	Brass	Steel	S.S.	Nickel
Aluminum	56	105	105	105	105	105
Copper	105	105	105	105	105	105
Brass	105	105	105	105	105	105
Steel	105	105	105	105	105	105
Stain. Steel	105	105	105	105	105	105
Nickel	105	105	105	105	105	105

Reference numbers above indicate All-State solder to be used for joining metals.

A set of four complete tables, covering temperature ranges from 400F to 800F, is yours for the asking. Send for free Instruction Manual, too.

Distributor-Stocked, convenient to buy. Economical to use.
ALL-STATE WELDING ALLOYS CO., INC., White Plains, N. Y.
Call WHite Plains 8-4646 or write for nearest distributor

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TO THE RESCUE
REJECTS LIKE CRAZY, JOE! YOU GOTTA DO SUMTHIN'!
THEM REJECTS ARE CAUSIN' ME TH' TORTURES O' HADES, DOC! I'M GOIN' BATS!
SUREST CURE FOR REJECTIVITIS, SIR, IS TUFFALOY COLD-FORMED TIPS. ASK YOUR P.A. TO GET 'EM!
Old-fashioned cast tips laying profits low? Switch to TUFFALOY COLD-FORMED TIPS. You'll get better conductivity, longer life . . . better fusion, fewer rejects.
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Air Reduction Pacific Company • Air Reduction Canada Limited

For More Information Circle No. 64 on Reader Service Card.

UNIQUE
AUTOMATIC WELDING HEAD MANIPULATORS

BOOM MOVEMENT IS COMPLETELY VIBRATION-FREE FOR THE MOST INTRICATE WELDING APPLICATIONS

absolute minimum boom deflection

- Heavy Seamless tubular construction minimizes deflection.
- Double chain lift for safety.
- Boom and mast move on Timken tapered bearings for friction-free operation.
- Boom completely adjustable for leveling.
- Electronic boom motor.
- Speed range: 3 to 100 ipm.
- Motor for lift has brake for easy positioning of welding head.
- Limit switches on all movements prevent over travel.
- Operating power: 220/440 or 550 volts, 3-phase.
- All motors have reversing magnetic; 110 volt system starters at operator station.
- Mast and boom rotate 360° on heavy friction-free bearings.
- Positive lock is provided.
- All controls at operator's fingertips.

U. M. SERIES STANDARD SIZES

BOOM		MAST
6'	x	6'
6'	x	8'
8'	x	6'
8'	x	8'
8'	x	10'
10'	x	8'
10'	x	10'
10'	x	12'
12'	x	10'
12'	x	12'
12'	x	14'
14'	x	14'
14'	x	16'
16'	x	14'
16'	x	16'

Larger sizes available or to your specifications

UNIQUE EQUIPMENT INC.
122 SUMPTER STREET • BROOKLYN 33, N. Y.

For More Information Circle No. 65 on Reader Service Card.

AUTOMATIC WELDING: USERS REPORT

continued from page 33

An automatic machine will come up to expectations if enough planning has gone into it. This is usually true at Goodyear. But when something is altered—the machine is asked to do something it was not designed to do, or the product specifications are changed—the machine won't perform. Goodyear gets that performance by changing it to suit the new condition.

An automatic welding machine, like any other machine, must pay for itself.

- Products: **Automotive and Military**
- Company: **Firestone Steel Products Co.**

The design of a product determines what welding process will be used. The quantity settles the need for manual or automatic equipment. These are the things which guide this subsidiary of Firestone Tire & Rubber Company in its selection of welding equipment.

If an automatic machine is proposed, a standard one is used if possible. If the design is complex, a special machine may be required.

The manufacturing-engineering group investigates the need for a welding machine. If their product is new, they make a prototype, and learn the best way to weld it. Production management will add their suggestions too, and the manufacturing engineers weigh all the suggestions. Then methods, standards, and accounting provide standard hours and cost estimates. If the costs are reasonable (or the savings substantial) specifications are written, and purchasing asks for bids.

If the project is large, production and development engineers meet with plant management to decide which manufacturers will be asked to bid. The quotations are closely analyzed for machine performance as well as price. The low bidder doesn't always get the job.

Firestone's executive engineer, Walter Bulgrin, reviews the cost and quotation analyses and recommends approval of purchase. In some case the president, Mario Di Federico, requests approval from the parent company.

The importance of the cost of an automatic welding machine depends on the volume—the number of pieces to be made. In a big project, the automatic is needed, so it must be bought. Cost is important in that the best machine is bought for the available money.

In a small project Firestone makes sure that the tail (automatic welder cost) doesn't wag the dog (limited number of pieces) and shake the profits out of the job. If the analysis shows that automatic costs are high, they'll use manual welding. If the product becomes a regular item, they'll buy an automatic machine.

AUTOMATIC WELDING: MANUFACTURERS REPORT

continued from page 35

C. B. Herrick, president,
C. B. Herrick Mfg. Corp., Cleveland, Ohio

"We use a standard questionnaire when helping a customer or prospect to prepare detailed specifications on automatic welding equipment. Nothing is left to anyone's imagination if this form is filled out properly. With complete specifications we can make an intelligent and accurate proposal. Here are the nine questions management should ask itself:

"Are our specs complete and realistic?

"Are we buying a single purpose machine when a general purpose, versatile unit will do both present and future jobs.

"Are we getting a large enough machine? In many cases more size represents only a modest extra cost.

"Are we specifying the proper degree of automation and flexibility? Provision can be made easily during original manufacture for additional features to be added later.

"How does this equipment compare with that being used by our leading competitors?

"Have we submitted identical specifications to prospective suppliers? Are these companies offering us similar equipment?

"Are we getting the quality, precision, ruggedness, versatility and degree of automation required? Can we expect long life and minimum maintenance?

"When fast delivery is required, will the supplier meet our requirements? Will he accept penalty clauses to prove his declared intentions?

"Will the supplier stand behind his product with a proper guarantee and ready, competent service?"

A. E. Johnson, manager,
Welding Equipment Sales,
A. O. Smith Corp., Elkhorn, Wisconsin

"Because the purchase of automatic or semi-automatic equipment represents a larger capital investment, management should be interested in the long-term productive usefulness of the equipment. Evaluation of competitive equipments should be made by the welding supervisor, welding engineer or methods department, but recommendations to management should include answers to the following five questions:

"First, are test results comparing competitive processes and equipments based on sound comparative test data? Second, can the equipment be maintained by existing facilities? If not, what must be done to assure continuity of production? Third, can the consumable product used in the equipment or process be procured from more than one source? Fourth, is the equipment versatile enough to assure long term usefulness after the present job is done? Finally, does the supplier have a research program and a proven progress record which gives assurance that the processes usable with the automatic equipment will keep the operation modern for the life of the equipment?"

PLASTIC WELDING

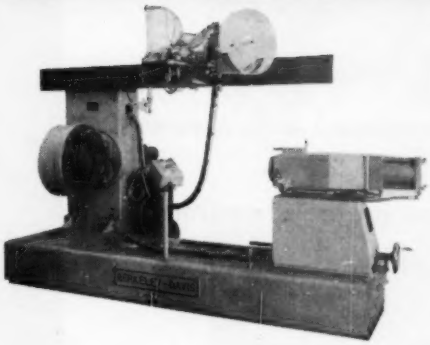
VALUABLE NEW DATA

During the last few years gas welding of plastics has been applied with particular success to a large and ever-increasing variety of constructions where it has proved invaluable. Information on this subject is rather scarce. This manual will be extremely valuable to practical welding people and to engineers who intend to incorporate plastic materials into their designs.

PRICE $6.00

WELDING DESIGN & FABRICATION
812 HURON ROAD
CLEVELAND 15, OHIO

SOMETHING NEW FROM BD



UNIVERSAL ROTATOR

with Tilting Headstock

Another first in the industry by Berkeley-Davis allows rotary seams to be welded in any required position within the rotator's capacity. The tilting headstock can convert the Universal Rotator into a welding positioner. The Universal Rotator accepts parts up to 48" diameter, 24" to 6' in length. Other lengths available upon request.

for Circumferential Welding of Tubes, Tanks, and Circular Pieces

Write for Full Information Today!

Berkeley-Davis Incorporated
AFFILIATED WITH THE Federal MACHINE AND WELDER COMPANY

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"DURO is the coolest"*

*says Ben Ruff of Reed & Graham, Inc. "Before I had to change holders whenever the one I was using would get hot. Now, with DURO, I can weld a whole shift without the holder getting hot to my hand, even when using 5/16 in. hardfacing electrodes at high amperages."

DURO will do the same for you

Proved by 27 years of weldor's preference

The DURO "Standard"

- All parts quickly replaced with a screwdriver
- Screw-in type jaws—no tools required
- Insulated handle and guard—protects the operator
- Rugged fibre handle—lasts longer
- Cool operation—cool handling

Featuring "Long Jaw Design" for reaching those "hard to get at places."

DURO

ENGINEERING COMPANY • 31 OREGON AVENUE

HAMDEN, CONN.

For More Information Circle No. 24 on Reader Service Card.

Lincoln's Student Competition Stimulates Welded Design

CLEVELAND, OHIO: The $5,000 in annual awards made by the James F. Lincoln Arc Welding Foundation in its design competition for college engineering undergraduates this year went to 66 students in 21 colleges and universities.

Scholarship funds honoring the recipients of the main awards were presented to the schools in which they were enrolled: The University of Minnesota, University of Illinois and New York University.

The first award of $1250 went to Seppo J. Viikinsalo of Parkville, Minnesota, for his design of a fire hydrant redesigned for welding. Dr. Richard C. Jordan is the head of the Department of Mechanical Engineering at the University of Minnesota in which Mr. Viikinsalo was registered. He will administer a scholarship fund of $1000 presented to the department by the Lincoln Foundation. A total of eight students at the University of Minnesota received awards in the competition, marking the best performance by students of any one school.

A University of Illinois civil engineering student, James Galinsky of Hammond, Indiana, received the second award of $1000 for his design of a welded hammerhead support. Head of the Department of Civil Engineering at the University is N. W. Newmark. His department received a $500 award to provide scholarships honoring Galinsky.

The third award of $500, made for the design of a welded aluminum hyperbolic paraboloid roof structure, was received by Robert Silman of Middle Village, New York, who made his design as a student in the Civil Engineering Department of New York University. The department head, James Michalos, also received a scholarship fund of $250.

The Lincoln Arc Welding Foundation has announced a similar undergraduate design competition for the current school year. All undergraduate students in all branches of engineering are eligible to participate. Closing date is July, 1960. A rules booklet is available from the Foundation at Cleveland 17, Ohio.

ELECTROSLAG WELDING *continued from page 36*

toughness in the heat affected zone because of the slow heating and cooling inherent in the process. However, this same slow heating and cooling may be used to eliminate preheat in welding the hardenable chromium-molybdenum and 3 percent nickel steels.

Since electroslag welding requires only a nominal one-inch joint, it uses ⅓ to ½ less filler metal than the submerged arc process for welding 6- to 12-inch plates. For a single electroslag electrode, the deposition rate of filler metal is 35 to 45 pounds per hour. In very heavy plates, for which three electrodes would be used, this rate would result in a deposition of 105 to 135 pounds of filler metal an hour.

Acros engineering personnel list these other advantages for the process:

Lower flux cost: Little or no flux is lost through spatter or evaporation. Electroslag welding consumes only about 5 pounds of flux for each 100 pounds of weld metal.

Less handling: There is no need for repositioning after welding has started. The usual type of rigger's handling equipment is adequate for most setups.

Mobility: The simple, sturdy design and construction of *Vertomatic* equipment permits the machine to be moved to the work if necessary. The equipment can even be transported into the field.

EQUIPMENT

The equipment consists of a six-foot tripod base mounted on rollers; a vertical mast attached to the tripod base (standard length is 22-feet); a boom, or carriage, which automatically moves upward on the mast as weld metal solidifies; a control panel from which all welding operations are automatically or manually controlled; a flux hopper and a motor-drive mechanism that moves the entire boom upward.

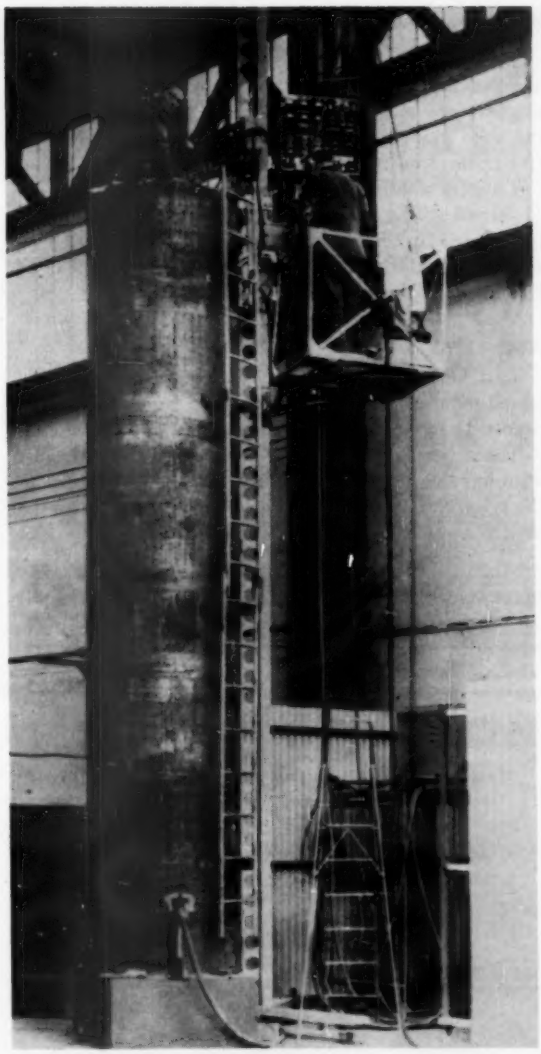
Attached to the boom and moving upward with it are one, two or three wire guides and a drive mechanism that moves the wire guides laterally in a back and forth motion. Holding clamps position copper shoes against the work to form a dam for the molten slag and weld metal. The water-cooled copper shoes bridge the gap of the work being joined. Two probes located in the face of these shoes actuate the upward movement as the weld metal is deposited and control the flux flow to the weld area.

In addition to the tripod mast section, there are three other pieces of equipment: A specially built AC transformer can be varied from drooping to constant potential characteristics (one transformer is required for each electrode wire used). A relay cabinet houses a series of industrial-type relays actuated through the control panel. One, two or three wire feed reels hold large size coils.

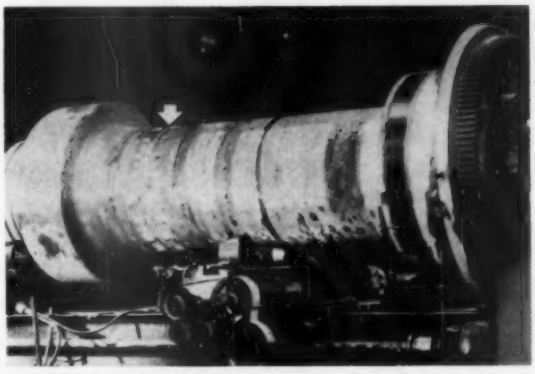
PREPARATION AND POSITIONING

Work edges are cut squarely for any type of weld. Edges are usually ground lightly to allow the copper shoes to move smoothly against work.

continued



IN FRENCH SHIPYARD stern shaft tube is made by welding two half cylinders longitudinally; tube is 17½-feet long, with 3¾-inch walls and 42-inch outside diameter.



IN CZECHOSLOVAKIA circumferential welding joins two sections of heavy walled cylinder. Copper shoes remain in fixed position during welding; the probe circuit that controls the upward movement in making longitudinal welds is connected to the turning rolls which move the work.

ELECTROSLAG WELDING *continued from page 69*

U-shaped aligners keep work pieces in alignment and maintain the gap between them. The legs of these aligners are tacked to the face of the work opposite the wire guides. Bridging the gap in this way allows free upward movement of the shoe.

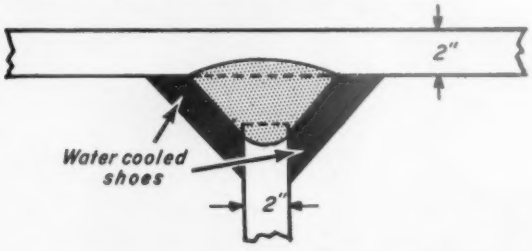
To start welding, it is necessary to use a pocket or U-shaped starting tab to build up the proper depth of conductive flux before welding reaches the work. Two run-off tabs are used to provide a dam for the slag in finishing off the weld.

WIRE TYPES

Two kinds of wire are used. One is a solid wire which requires a deoxidizing flux fed from a hopper as needed to maintain proper slag depth.

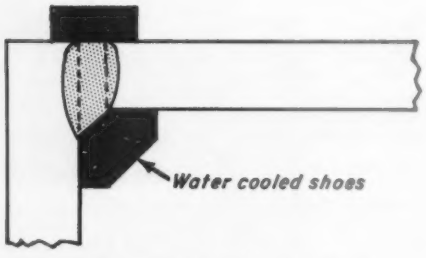
The other is a flux-cored or composite wire. This wire has two distinct advantages. Flux is contained in the wire and can be introduced more deeply into the molten slag than flux which is fed on top of the slag pool. This deep penetration gives a better fluxing action. The second advantages is that a wide range of weld metal analyses can be developed by introducing appropriate alloys through the flux.

TYPICAL JOINTS made by the Electroslag process.



T-Joint welded from one side with oscillation

Reinforcing surface welds



Corner weld with inside fillet

OPERATION

Welding starts in the U-shaped starting tab in much the same way a submerged arc weld starts. As soon as deep enough pool of molten slag is built up, there is a transition in which heat required for coalescence ceases to be generated by an arc. The resistance of the molten slag to the current flow becomes the dominant heat-creating factor. During this start-up period, the operator makes the necessary adjustment in controls to change the transformer operation from constant current to constant voltage characteristics. Once the proper electrical conditions are set for the work being done, the operation is fully automatic. The operator only has to make occasional readjustments.

Besides being continuously fed into the molten slag, wire is constantly moved back and forth through it. This stirring action helps distribute the heat more uniformly. At the end of each traverse motion, there are a few seconds in which the wire continues to be fed but does not move laterally. This occurs close to the copper shoes and is done to overcome the cooling effect of the water-cooled shoes. This sets up conditions for coalescence and cooling comparable to those existing in the center of the weld.

Through selected gear combinations, an operator can set appropriate vertical, traverse and wire feed speeds.

RESULTS

Macrographic examinations of an electroslag manganese-moly weld in a 3-inch medium carbon steel plate discloses the typical coarse dendritic pattern frequently reported in foreign literature. On the other hand, a special composite wire produces a mild steel deposit in a 3-inch plate which shows a clean, uniform ferrite-pearlite microstructure. The chemical and mechanical properties of both electroslag welds appear to be quite satisfactory.

TABLE 1 · PROPERTIES OF ELECTROSLAG WELDS

CHEMICAL ANALYSIS

	C	Mn	Si	S	P	Mo
Mang.-Moly	.08	1.84	.37	.016	.019	.32
Mild Steel	.13	1.13	.33	.024	.020	.09

MECHANICAL PROPERTIES

	Yield Strength ksi	Tensile Strength ksi	Elongation in 2" %	Reduction in Area %	V-Notch Charpy at Room Temp. Ft.Lbs
Mang.-Moly	66.0	87.6	19	43	26,28,28
Mild Steel	48.7	74.1	28	59	------

When proper techniques are used, there is little distortion due to shrinkage after cooling. In spite of the heat build up by a single pass there is no tendency for the plates to bend at the joint. Shrinkage in the plane of the butt weld is limited to ¼-inch maximum. ••

Circle No. 70 on Reader Service Card.

For More Information Circle No. 57 on Reader Service Card.

SMS CORPORATION

Headquarters for Resistance Welding Supplies

R.W.M.A. Classes of alloys in castings, forgings and bar stock; copper tungsten alloys

Standard electrodes; special electrodes and fixtures designed and built

All types of straight and offset holders

Welder wheels in all alloys and sizes

Tip dressers, reamers and contour dressers

Adjust-A-Pressure holders (above, left) used with Adjust-A-Angle adapters solve many welding problems; change from one electrode spacing to another — a matter of minutes — with the same set-up.

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ROTATING *Welding Table*

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Check these features:

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Get the exact current for quality welding!

USE THE TONG-TEST AC-DC AMMETER

Don't assume your welders are using the right amperage. *Be certain* by controlling welding quality with the Columbia Tong Test AC-DC Ammeter, the only clamp-type instrument that measures both alternating and direct current. Snap tongs around the electrode cable for instant readings. Available in five types with interchangeable ranges up to 1000 amperes. Impossible to read wrong scale. No coils or wires to burn out—no electrical connections needed.

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Columbia Electric Mfg. Co.

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NEW PRODUCTS

Positioner Hole

Now standard on all P & H welding positioners, 500 to 10,000 lb. capacities, is a hole through the table and table spindle. According to the manufacturer, Harnischfeger Corporation, this feature greatly facilitates the use of gas lines for back up and pre-heating, and air lines for pneumatic clamping.

Circle No. 110 on Reader Service Card.

Rocker Arm Welders

The development of new improved types of Rocker Arm Welders is announced by the Universal Electroweld Division, Electric Arc, Inc. The new single phase welders feature easy operation, maintenance and broader work ranges.

Made in both air-actuated and foot-operated models, the new machines have KVA ratings of from 10 to 75, and throat depths ranging from 12 inches to 36 inches.

Circle No. 111 on Reader Service Card.

New Jet Flux Dispenser

An improved automatic liquid flux dispenser, called the Mark III, has been announced by All-State Welding Alloys Company. Unit mixes flux with acytelene in the exact amount for the pressure and tip size being used.

The dispenser valve is said to be safe and efficient. The valve is easy to take apart and clean.

Two kinds of brazing liquids are available. One for production-, the other for maintenance-brazing.

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* DESIGNED TO MEASURE SHORT PULSES OF HEAVY CURRENT

* MINIMUM OF 100 AMPS & MAXIMUM OF 100,000 OVER 6 SCALES

* NO INTERRUPTION OF WELDING OPERATION

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RESISTANCE WELDING CURRENT METER

* READINGS CAN BE TAKEN MINUTES AFTER WELD COMPLETED

* CAN BE USED WITH SYNCHRONOUS & NON-SYNCHRONOUS TIMERS

* MONITORS BOTH WELDING CURRENT & TIME SIMULTANEOUSLY

A new instrument of particular interest to every Welding Engineer

The standard instrument has six ranges covering readings of 100 to 100,000 amps. The readings are obtained by the use of toriods which can be split and placed around the heavy current conductor. Indication is stored enabling readings to be taken minutes after the weld is made.

Can be used with welders employing synchronous and non-synchronous and energy storage controls. *Full details and illustrated leaflet available on request.*

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Jetweld LH-90, E-9018-G,
Jetweld LH-110, E-11018-G.

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For More Information Circle No. 32 on Reader Service Card.

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You can put a "Tool Steel" cutting edge on ordinary low carbon steel . . . with HARD-N-TUFF Steel Hardening Compound.

- It's easy as 1, 2, 3 to use HARD-N-TUFF in your shop without special equipment.
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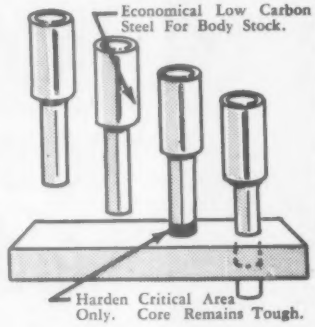
- Punches made of inexpensive SAE-1112 steel, reports one HARD-N-TUFF user, outlast those made of costly SAE-4245 molybdenum steel.
- Extra hard edges stay sharp longer . . . retain hardness under extreme heat.
- Tool core remains tough, non-brittle . . . resists breakage.



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For More Information Circle No. 52 on Reader Service Card.

New Powder-Jet Guns

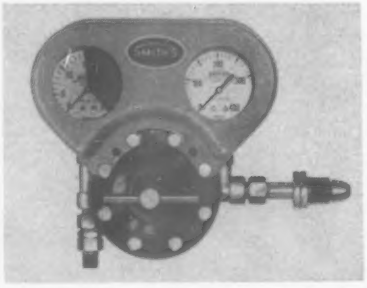
Two new metallizing gravity feed guns are available from Metallizing Co. of America. An exclusive vacuum feed permits a positive, even flow of powder to be sprayed from any angle. Vacuum feed, produced by movement of gases through the gun, eliminates condensation. A separate hopper provides flexibility of operation; powder and compressed air do not mix until emitted.

Circle No. 113 on Reader Service Card.

Protected Electrodes

A polyethelene covered fiber container with recessed metal ends and replaceable cap now packages The McKay Company's Hard Surfacing Electrodes. Called Rod-Pac, package stops moisture until opened. The cap protects electrodes for weeks, sealed with cellulose tape, for long term storage. The containers also protect effectively against shipping damage.

Circle No. 114 on Reader Service Card.



Safe Use Regulator

A regulator with new safety features is being marketed by Smith Welding Equipment Corporation. Called Saf-T-Pak, unit eliminates the common use-dangers: A Hard-hat enclosure protects gauges against exterior damage; Flo-trol prevents reverse flow and mixture of gases—an explosion danger; and, a safety inlet connector speeds repair of damaged connections—without special tools.

Saf-T-Paks are available for oxygen, acetylene and LP gas applications.

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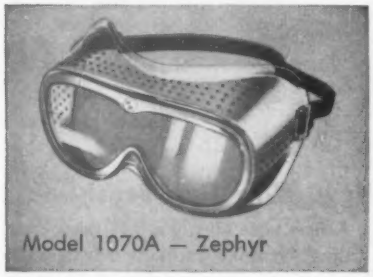
THE *NEW* VIEW FOR WELDERS!

WELSH sets the pace in creative design . . . new modern materials and techniques for your more effective eye protection.



Model 1070A — Zephyr

WELSH ZEPHYR — New, increased working visibility . . . greater top ventilation! The first major improvement since the origin of the soft-side. Choice of five ventilation styles.

Model 5070 — Cyclops

WELSH CYCLOPS — A one piece aperture welding goggle . . . soft side frame provides the ultimate in comfort, fit and visibility. Simplified lens holder permits easier changing of filter and cover plates.

Model 5050 — Soft-I

WELSH SOFT-I — Cushion-fit eye protection featuring unique, soft, pliable frame cover goggles. Deep cuts fit easily over largest prescription goggles.

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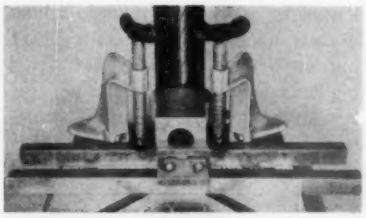

Hold-Down Clamps

A clamp for holding work on any surface—not only at edges—has been announced by Adjustable Clamp Company.

The clamp attaches to wood or metal surfaces with a bolt spotted to the work. A slot in the clamp base engages the bolt head for quick positioning.

The speed and holding pressure of the clamp make it adaptable for metal and woodworking shop applications.

Circle No. 116 on Reader Service Card.

Straight Front Helmet

A new, standard size Fiberglas-reinforced plastic welding helmet introduced by Hobart Brothers Co. has a straight front to provide better ventilation and more chest protection.

The one-piece Model 1210 has a fixed lens holder so light won't leak in. It is available in six colors.

Model 1211 (gray only) has a lift-front lens holder.

Circle No. 117 on Reader Service Card.

Goggles And Plate Holders

A new coverall goggle and a new plate holder for chippers and welders has been announced by Bausch & Lomb Optical Co. The soft vinyl goggle easily fits glasses, and conforms to face and head contours. Louvred type for welders is available with Arc-ban glass and plastic cover lenses. Mesh screened chipper's model can have clear lens or Ray-ban shades.

The flexible plate holder gives wide vision for chippers or welders. Side slide speeds plate changes.

Circle No. 118 on Reader Service Card.

Tempilstik°

*temperature indicating crayons**

**Also Tempil° Pellets and Tempilaq° (liquid form)*

***Tempilstik*°—a simple and accurate means of determining preheating and stress relieving temperatures in welding operations. Widely used in all heat treating—as well as in hundreds of other heat-dependent processes in industry. Available in 80 different temperature ratings from 113°F to 2500°F . . . $2.00 each.**

Send for *free* sample Tempil° Pellets. State temperature desired . . . Sorry, no sample Tempilstiks°

Most industrial and welding supply houses carry Tempilstiks° . . . if yours does not, write for information to:

SALES DEPARTMENT

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132 West 22nd St., New York 11, N. Y.

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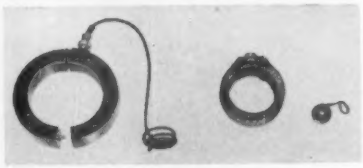


Resistance Welding Meter

A welding current meter designed to measure short pulses of heavy current has been announced by Hirst Electronic Ltd., Sussex, England. Instrument can be used with synchronous, non-synchronous, and stored energy machines. Correction is used in metering phase shift heat control machines. Split (standard) ring current transformer, or fixed ring transformers are available.

Instrument features: no interruption of welding, readings can be taken after weld is made, and simple operation.

Circle No. 37 on Reader Service Card.

Nickel-Base Alloy

A new nickel-base alloy, developed as a container material for molten fluoride salts, is now being produced on a developmental basis by Haynes Stellite Company, Division of Union Carbide Corporation. This new alloy, called "Hastelloy" alloy N, evolved from work done at Oak Ridge National Laboratories.

Alloy N has good weldability and can be readily forged. It is said to have outstanding resistance to embrittlement at temperatures up to 1600°F, and has good corrosion resistance. The hot-working range is between 1600 and 2150 deg F.

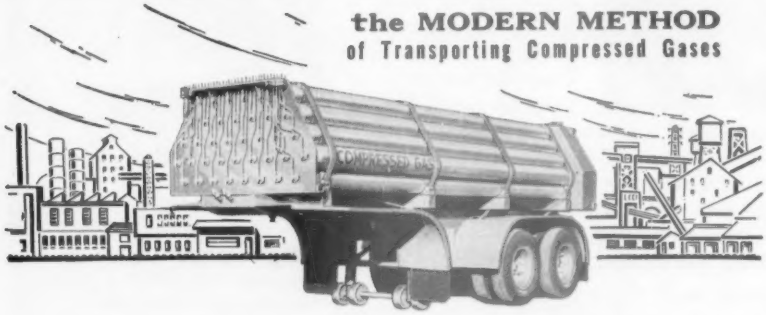
The alloy can be supplied as sheet, plate, bar, wire, coated welding electrodes; and sand-, shell-, and investment-castings with guaranteed chemical composition.

Circle No. 120 on Reader Service Card.

New Wire Cup Brush

A new wire cup brush, UDX6, for scaling, cleaning and rough finishing applications is available from the Anderson Corporation. The easy-to-handle cup brush gives smooth performance at speeds up to 7000 RPM and offers extra long life with heavy cutting capacity. The new turret-back cup is said to give extra strength and safety. Anderson makes a complete line of wire brushes.

Circle No. 121 on Reader Service Card.



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STEEL LIFTING CLAMPS

- 14 Different designs
- ½ Ton to 20 Ton Capacity
- 5 to 1 Safety factor
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- 3 to 1 before shipment

Special design clamps available on request

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Safety Snap Lock

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QUIK HEAT

up to 2200° F.

CLEMENTS Cadillac

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MODEL K

BLOWTORCH

Here's a big, efficient blowtorch for all kinds of heat treating and production processes—yet it is completely and easily portable. Operates economically on either natural or manufactured gas. Produces heat up to 2200° F. in seconds! 1/3 h. p., Universal Motor. Sealed, precision ball bearings require no oiling. Equipped with metal stand, 10 ft. of gas hose and 20 ft. of reinforced rubber covered Underwriters' Approved cord with plug.

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POWER HACKSAW

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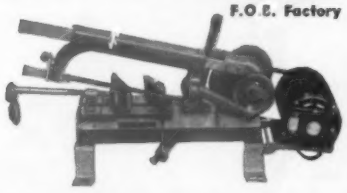

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Complete with motor and switch, wired, ready-to-go.

SAWS . . . bar, round, angle or pipe up to 4" x 4".

RUGGED . . Cast base, heavier guide bar support arms and guide bar with adjustable bronze wear plate and Oilite bearings throughout.

FEATURES . include fast acting 45° swivel vise, pressure relief on back stroke, length gauge bar, motor mount and ¼ h.p. motor. Built by builders of power hacksaws for industry since 1931.

Order from your Welding Equipment Dealer or write direct for details or prompt shipment.

KELLER DIV.

Sales Service Mfg. Co.

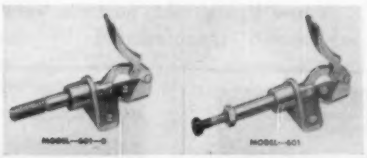
2365 University Ave., St. Paul 14N, Minn.

Circle No. 58 on Reader Service Card.

New Plasma Flame Spray Gun

A new spray gun manufactured by Metallizing Engineering Co., Inc. uitlizes the plasma-arc principle. It develops work temperatures of 10,000 to 15,000°F, and will spray any material that will melt without decomposing. The new gun is designed for push-button operation. It provides a practical means of applying coatings of high melting-point materials. Nitrogen and hydrogen are used to generate heat. Costs are said to be reduced to about half of that for an oxyacetylene flame.

Circle No. 122 on Reader Service Card.



Plunger Toggle Clamps

Two new toggle clamps that lock open or closed and have a holding pressure of 95 lb. have been announced by Detroit Stamping Co.

Plunger Model 601 takes a rubber-tipped spindle and lock nut for adjusting its reach. The 601-0 plunger is threaded to position various holding devices. Base-mount holes fit standard peg board plates. The iridite-coated plunger has a centerline ½ inches high, and a ⅝-inch stroke.

Circle No. 123 on Reader Service Card.

Goggle Cleaning

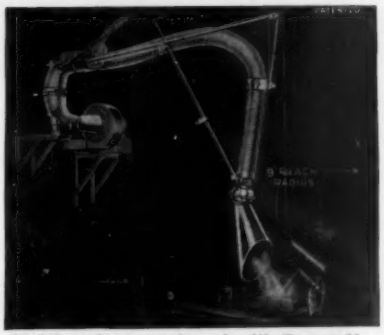
Mine Safety Appliances Company has made available a new goggle-cleaning station with finger-tip convenience.

The new low-cost station is a compact all-metal cabinet which has a capacity of 200 sheets and provides a fresh tissue each time one is removed. This handy cabinet measures 6-inches high, 5-¼-inches wide and 6-inches deep.

Circle No. 124 on Reader Service Card.

Circle No. 56 on Reader Service Card.

Remove Welding Fumes at the Source... with RUEMELIN FUME COLLECTOR



Welding shops equipped with Ruemelin Fume Collectors are assured of a clean shop atmosphere. Noxious fumes, heat and smoke are eliminated AT THEIR SOURCE. Improves working conditions . . . lessens fatigue . . . paves the way for increased plant production. Especially helpful in winter months when windows and doors are closed.

Note the new spring-loaded counterbalance mechanism which makes Fume Collectors much easier to handle.

WRITE FOR DETAILED INFORMATION

RUEMELIN MFG. CO.

3932 N. PALMER STREET • MILWAUKEE 12, WIS., U.S.A.

Mfrs. & Engineers • Sand Blast & Dust Collecting Equipment

No Other Product Can Do a Galvanizing Job Like

Galvalloy

Does - *HERE'S PROOF*

Heat welded seam on galvanized sheet to 600° with Torch

Rub GALVALLOY against heated surface as shown — now spread with wire brush for a bright finish.

GALVALLOY Covers the Same Amount of Area with 1/5 the Amount of Material.

Send today for Testing Sample and you'll learn Why GALVALLOY has no equal for ANY Galvanizing Job.

METALLOY PRODUCTS CO.

1233 S. BOYLE AVE., LOS ANGELES 23

Circle No. 50 on Reader Service Card.

New Heavy Duty Nibbler

Fenway Machine Co. has announced a heavy duty, portable nibbler, Model EHN. It cuts ¼" steel and 5/16" aluminum on either side, without distortion.

The new model is ideal for template making without grinding or buffing. Cuts are said to be clean . . . you get no rough edges, chipping, binding or curling.

The EHN uses: anti-friction bearings, lightweight aluminum housing, and a 2½ h.p. universal type ac-dc, 115 volt, 60 cycle motor. It has a cutting radius of 8 inches, and weighs 20 lbs.

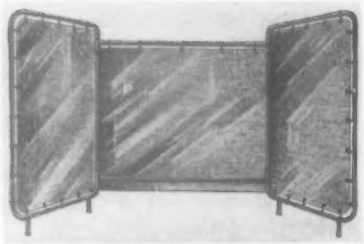
Circle No. 125 on Reader Service Card.

Expanding Abrasive Cone

A new expanding cone called Flexcone has been developed by Nu-Matic Grinders, Inc. to eliminate abrasive waste associated with normal cone grinding. The manufacturer's field tests have shown the gain of about 1/3 more abrasive sleeve life with the use of the expanded cone.

Flexcone has machined aluminum core with individual rubber flexers. Flexers expand and grip sleeve only when in motion, permitting easy replacement.

Circle No. 126 on Reader Service Card.



Portable Asbestos Screen

A new lightweight, portable welding screen manufactured by the Singer Glove Mfg. Co. is made of 1" tubular steel. Its slip joint construction helps make assembly fast.

The screen can be used as a straight line or 3-sided enclosure. The new screen uses Johns-Manville's aluminized asbestos and a laminated aluminum foil curtain. The screen protects against radiant heat and flame reflection, and can withstand heats up to 1400°F.

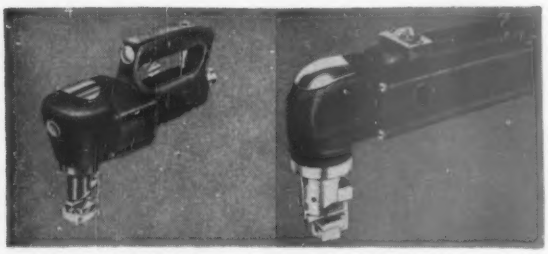
Screens are also available with 12 oz. fire-resistant duck and neoprene-coated fiber glass curtains. Single and 4-sided units are also available.

Circle No. 127 on Reader Service Card.

Flux Recirculating

The flux-recirculating Model BEMS roller and idler rebuilding machine is now available from L & B Welding Equipment, Inc. The unit features a 150-pound flux container on the fixture carriage. A flux pick-up nozzle is attached to each of the two wire feed welding contactors with flexible hose. It picks up all the unfused flux and dust.

Circle No. 128 on Reader Service Card.



Model AN Model LN

CUT YOUR METAL CUTTING COSTS 75%, USE THE FENWAY POWERFUL, PORTABLE NIBBLER WITH THE BIG PUNCH

INCREASE PRODUCTION! Save Metal Waste! Eliminate Finishing Operations!

Portable FENWAY NIBBLERS (air powered or electric) are easily moved to the cutting job (wt: 8-13 pounds according to model)—You can cut up to five feet per minute without distortion. Your metal waste is cut to a minimum—No grinding or buffing to finish off. Fenway Nibblers cut up to 8 gauge mild steel or 10 gauge stainless. Easily converted to cut corrugated sheeting, small diameter ducts, formed sheet metal pipe, tough pitch or asbestos coated corrugated steel—consistent smooth edges, no curling, no chipping, no flaking. Investigate this powerful, durable time saving nibbler. Easy to handle, minimum maintenance, unconditionally guaranteed. ¼" nibbler available soon.

WRITE TODAY FOR FREE DEMONSTRATION

FENWAY MACHINE CO., INC.,

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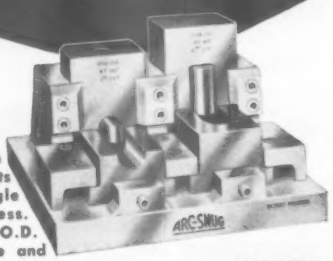
PLANT MAINTENANCE SHOW—BOOTH 1130

For More Information Circle No. 28 on Reader Service Card.

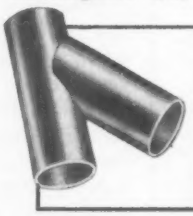
Cuts the FASTEST and FINEST NOTCHES Ever Made!

ARC-SNUG



ARC-SNUG gives you clean-edge, close-fitting, true contour notching by making both the first and second cuts of the notch in a single downstroke of the press. Notches ½" to 1¼" O.D. metal tubing (16 gauge and under) at angles ranging from 35 to 90 degrees. Special sizes and special dies to cut stainless steel, Monel metal, etc., made to order. Dies for various angles and sizes are interchangeable. Write for literature.

NOTCHED SAMPLES GLADLY FURNISHED



Combines 2 operations in one... to give you the snuggest fitting, angular tubing joints for cheaper, quicker, easier welding.

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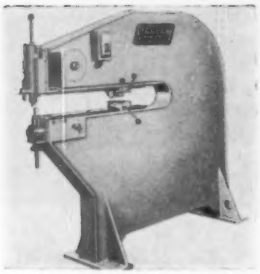


Metalworking Machine

Model TE-281 is the latest addition to the Tru-Edge line of Metlmastr shearling, forming and piercing machines made by Lennox Tool and Machiner Builders.

The new model has a maximum edge-cutting capacity of 9/32-inches in mild steel plate and 3/16-inch in stainless. Throat depth is 49¼-inches, permitting circle cutting up to 48-inch diameter inside throat.

Unit has a cutting speed up to 36 fpm with number of cuts per minute from 1750 to 3500. Model TE-281 features single unit, stress-relieved welded construction. Shipping weight is 3600 lbs.

Circle No. 129 on Reader Service Card.

AUTOMATIC WELDING GANTRY

continued from page 45

a minute are obtained.

The gantry is mounted on four wheels and travels at the rate of 33 ft. a minute. The wheels on one side run on a track. They are 10 inches in diameter of semisteel, and have V-grooves to fit the inverted angle-iron track. These wheels are also the drive wheels. They are connected to the driving motor by chains and sprockets. The other pair of wheels are rubber tired and roll free on the concrete floor. The first gantry welder proved so successful on a sixteen month production hitch, Reynolds lost no time in installing a second just like it. • •

ALLOY STEEL PRESSURE VESSELS

continued from page 53

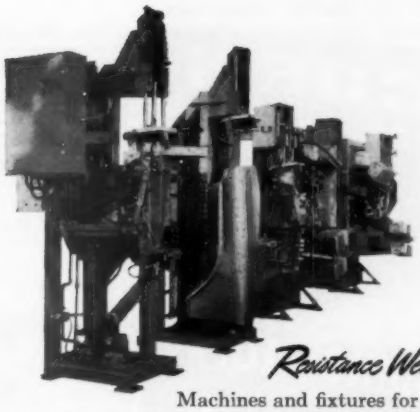
to disclose cracks or porosity. Hardness tests are also made on both weld and base metal to make sure of response to heat treatment. It tests material too. Wring one won't usually heat treat properly).

7. Pressure test at 28,000 psig, plus or minus 500 psig. If a major diameter stretches more than 0.004 inches or the vessel fractures it is rejected.

With such close controls, pressure vessel rejects due to weld defects is kept under 1%. Defects are caught early and their causes corrected right away. • •

Viking Welding Moves To New Location

MILWAUKEE, WISCONSIN: Viking Welding Supply has moved to new headquarters in the heart of Milwaukee's industrial area at 1230 North 70th St. The company is a distributor for all of A. O. Smith Corporation's electrodes and welding machines.



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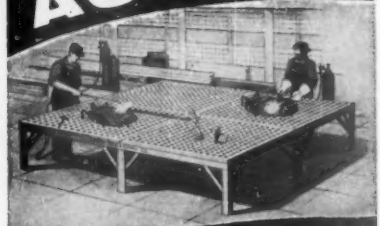

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Semi-steel Blocks for layout, welding assembly work, etc., with machined working surfaces; also tools and accessories, including a full line of clamps, drift pins and dogging devices. Standard and special stands can be supplied. A 4-unit set-up, joined and mounted on stands, is shown above.

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RANSOME COMPANY's general offices at Scotch Plains, New Jersey

Ransome names re-emerges in the welding industry

SCOTCH PLAINS, NEW JERSEY: The re-emergence of the 110-year-old name, Ransome, pioneer manufacturer of welding positioning equipment, has been announced by Paul Galton, general manager of the new Ransome Company.

The Ransome Company recently purchased the complete welding positioner business of the Worthington Corporation. It will handle all phases of this business. As a result, Worthington Corp. will no longer engage in the sale or manufacture of welding equipment. Ransome manufacturing operations are being continued at the Worthington Plainfield Division while a new Ransome manufacturing facility is under way.

GALTON

Mr. Galton stated "It is the Ransome Company aim to continue the manufacture of the standard line of positioners, turning rolls and manipulators and, at the same time, enter fully into the field of machine tools for automatic welding."

The original Ransome Machinery Company was founded in 1850. In 1932 it introduced the first commercial welding positioner. In 1943, Worthington Corp. purchased the company and incorporated it into its Worthington-Ransome Division.

The new company is now a wholly-owned division of the Big Three Welding Equipment Co. of Houston, Texas, for 40 years a leading manufacturer and distributor of welding equipment and gases.

Mr. Galton brings with him 19 years of experience in the welding industry. Prior to this move, he was General Sales Manager of the Worthington Plainfield Division, which included the Positioning Equipment Division, as well as the Concrete Machinery Division.

ABOUT CGA

continued from page 12

develop and promulgate methods for the safe handling of containers and their contents. We also investigate the causes of accidents in order to obtain information to help minimize or eliminate them in the future.

By championing these and many other causes, the CGA has made technical improvements available to the large manufacturer and the small welding shop owner or welding operator alike. In promoting safer equipment and more efficient design, countless accidents have been prevented.

As evidence of the progressive nature of our organization, the rapidly growing importance of cryogenics has led to the establishment of our Cryogenic Gases Committee, newest of our standing committees. Prompted by industry's wide acceptance of cryogenic gases, both as a means of shipping and storing gases in their liquid state, and in using cryogenic fluids as such, this new arm of the CGA will assure cryogenic gas users of the same safe, well engineered equipment, standardized connections, and equitable regulations involving the packaging, transportation, storage and safe handling of cryogenic gases as it has done for other compressed gases. • •

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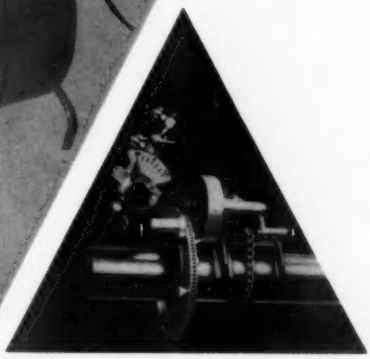

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